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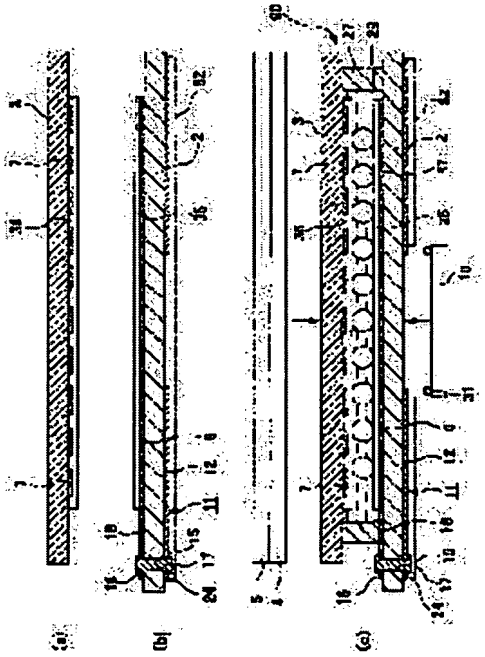
(54) METHOD FOR MANUFACTURING LIQUID CRYSTAL DEVICE, LIQUID CRYSTAL DEVICE AND ELECTRONIC EQUIPMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method for manufacturing a liquid crystal device which can be miniaturized by making the frame narrow without causing any decrease in display quality.
SOLUTION: In this method, the liquid crystal device having a liquid crystal layer 28 sandwiched between 1st and 2nd substrates 2 and 3 stuck together with a seal material 27 opposite each other is manufactured through a substrate sticking stage where the 1st substrate 2 and 2nd substrate 3 are stuck together through a seal material 27 so that a signal electrode 6 and the scanning electrode 7 face each other on the internal surfaces and a laying wiring for a scanning electrode allows upper-lower conduction between a pair of substrates 2 and 3, and then a mounting stage where a driving IC 10 is mounted on the external surface of the 1st substrate 2 and electrically connected to a wire 11 and the laying wiring for the scanning electrode.



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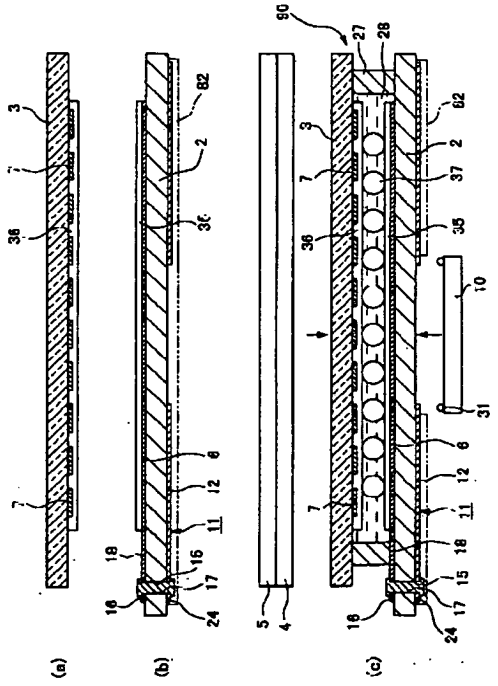
(54)【発明の名称】　液晶装置の製造方法および液晶装置と電子機器

(57)【要約】
【課題】　表示品質の低下を招くことなく、狭額縁化による小型化を図ることができる液晶装置の製造方法の提供。
【解決手段】　互いに対向してシール材２７によって貼り合わされた第１と第２の基板２，３間に液晶層２８が挟持された液晶装置の製造方法であって、第１の基板２と第２の基板３とを信号電極６と走査電極７とを互いに内面で対向するようにシール材２７を介し貼り合わせるとともに、走査電極用引き回し配線において一対の基板２，３間での上下導通を行う基板貼り合わせ工程後、第１の基板２の外面上に駆動用ＩＣ１０を実装し、ＩＣ１０を配線１１と走査電極用引き廻し配線と電気的に接続する実装工程を備えた液晶装置の製造方法。



【特許請求の範囲】

【請求項１】　互いに対向してシール材によって貼り合わされた一対の基板間に液晶層が挟持され、前記一対の基板のうち第１の基板には、前記液晶層に面する側の内面上に第１の導電部が設けられ、該第１の導電部と電気的に接続されるとともに前記第１の基板内部を介して前記内面上から該内面と反対側の外面上に電気的に接続される第１の引き廻し導電部が形成され、前記一対の基板のうち第２の基板には、前記液晶層に面する側の内面上に第２の導電部が設けられ、前記一対の基板間での上下導通により前記第２の導電部と電気的に接続されるとともに前記第１の基板内部を介して更に前記第１の基板の内面上から該内面と反対側の外面上に電気的に接続される第２の引き廻し導電部が形成され、前記第１の基板の外面上には前記第１の引き廻し導電部および／または前記第２の引き廻し導電部と電気的に接続された電子部品が実装された液晶装置の製造方法であって、

前記第１の基板と前記第２の基板とを前記第１の導電部と第２の導電部とが互いに内面で対向するように前記シール材を介し貼り合わせるとともに、前記第２の引き廻し導電部において前記一対の基板間での前記上下導通を行う基板貼り合わせ工程後、

前記第１の基板の外面上に前記電子部品を実装し、前記第１の引き廻し導電部および／または前記第２の引き廻し導電部と電気的に接続する実装工程を備えたことを特徴とする液晶装置の製造方法。

【請求項２】　第２の基板と貼り合わせ前の第１の基板の外面に、少なくとも第１の引き廻し導電部と第２の引き廻し導電部を覆う第１の保護層を形成する工程を設けることを特徴とする請求項１記載の液晶装置の製造方法。

【請求項３】　電子部品の実装工程前に、前記第１の保護層を部分的に剥離する工程が備えられることを特徴とする請求項２記載の液晶装置の製造方法。

【請求項４】　前記第１の保護層の部分的剥離工程と、前記電子部品の実装工程の間に、前記基板貼り合わせ工程で貼り合わした第１と第２の基板の検査工程が備えられることを特徴とする請求項２又は３に記載の液晶装置の製造方法。

【請求項５】　前記電子部品の実装工程において、前記第１の基板に予め形成した凹部に前記電子部品の少なくとも一部を埋め込むことを特徴とする請求項１乃至４のいずれか一項に記載の液晶装置の製造方法。

【請求項６】　前記電子部品の実装工程の後に、第１の基板の外面側に少なくとも前記電子部品と第１と第２の引き廻し導電部との接続部を覆う第２の保護層を形成する工程が備えられることを特徴とする請求項１乃至５のいずれか一項に記載の液晶装置の製造方法。

【請求項７】　前記第１の基板および／または前記第２の基板として可撓性を有する基板を用いることを特徴とする請求項１乃至６のいずれか一項に記載の液晶装置の製造方法。

【請求項８】　前記第１の基板として、基板内部に１層以上の内部導電部を有する基板を用いることを特徴とする請求項７に記載の液晶装置の製造方法。

【請求項９】　前記第１の基板として、内面側の第１の導電部と外面側の引き廻し導電部を同じ導電性材料で構成したものを用いることを特徴とする請求項１乃至８のいずれか一項に記載の液晶装置の製造方法。

【請求項１０】　前記第１の基板として、内面側の第１の導電部と外面側の第１の引き廻し導電部を異なる導電性材料で構成したものを用いることを特徴とする請求項１乃至８のいずれか一項に記載の液晶装置の製造方法。

【請求項１１】　前記電子部品の実装工程において、第１の基板の外面上であって、非表示領域に対応する部分に前記電子部品を実装することを特徴とする請求項１乃至１０のいずれか一項に記載の液晶装置の製造方法。

【請求項１２】　前記基板貼り合わせ工程において前記第１の基板として、外面側周縁部に前記電子部品の入力端子と電気的に接続される外部接続端子が設けられたものを用いることを特徴とする請求項１乃至１１のいずれか一項に記載の液晶装置の製造方法。

【請求項１３】　前記基板貼り合わせ工程において前記第１の基板として、外面側周縁部に前記第１の引き廻し導電部および前記第２の引き廻し導電部と電気的に接続された外部接続端子が設けられたものを用いることを特徴とする請求項１乃至１１のいずれか一項に記載の液晶装置の製造方法。

【請求項１４】　互いに対向配置された一対の基板間に液晶層が挟持された液晶装置であって、

前記一対の基板のうち、第１の基板においては前記液晶層に面する内面上に第１の導電部が設けられるとともに、該第１の導電部と電気的に接続された第１の引き廻し導電部が前記内面から基板内部を通り前記内面と反対側の外面にわたって設けられ、透光性を有する第２の基板においては前記液晶層に面する内面上に第２の導電部が設けられるとともに、該第２の導電部と電気的に接続された第２の引き廻し導電部が前記第２の基板の内面から前記第１の基板の内面へ、さらに第１の基板の内面から基板内部を通り第１の基板の外面にわたって設けられ、前記第１の基板の外方又は外面側には前記第１の引き廻し導電部および前記第２の引き廻し導電部と電気的に接続された電子部品が実装され、前記第１の基板の外面側には少なくとも第１の引き廻し導電部と第２の引き廻し導電部を覆う第１の保護層が設けられたことを特徴とする液晶装置。

【請求項１５】　前記第１の基板の外面側に実装された電子部品は、少なくとも一部が前記第１の基板に埋め込まれていることを特徴とする請求項１４に記載の液晶装置。

【請求項１６】　前記電子部品が実装された第１の基板の外面側には少なくとも前記電子部品と第１と第２の引き廻し導電部との接続部を覆う第２の保護層が設けられたことを特徴とする請求項１４又は１５に記載の液晶装置。

【請求項１７】　前記第１の基板および／または前記第２の基板が可撓性を有する基板で構成されたことを特徴とする請求項１４に記載の液晶装置。

【請求項１８】　前記第１の基板の外面上であって、非表示領域に対応する部位に、前記電子部品が実装されたことを特徴とする請求項１４ないし１７のいずれか一項に記載の液晶装置。

【請求項１９】　請求項１４乃至１８のいずれか一項に記載の液晶装置を備えたことを特徴とする電子機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、液晶装置の製造方法および液晶装置と電子機器に関し、特に液晶装置の小型化にあたって表示領域外の領域を極力狭くした構造の液晶表示パネルの製造方法に関するものである。

【０００２】

【従来の技術】近年、ノートパソコン、携帯電話機、腕時計等の携帯用電子機器において、各種の情報を表示する手段として液晶表示パネルが広く使用されている。特に携帯用電子機器等では、筐体内部の限られた空間に液晶表示パネルを収容し、しかも表示し得る情報量を多くしたいという要求から、表示領域を極力広く、表示領域外の部分（以下、本明細書ではこの部分を非表示領域または額縁などという）を狭くする構成が望まれている。

【０００３】通常、この種の液晶表示装置、特にパッシブマトリクス（単純マトリクス）型と呼ばれる液晶表示装置では、２枚の透明基板間に液晶が封入され、各透明基板の対向面に互いに直交するストライプ状の透明電極が形成されている。この液晶表示装置では、２枚の基板上の透明電極が互いに交差する部分が画素となり、液晶を各画素毎に外部から駆動する方式が採用されている。液晶を外部から駆動するためには、例えば各透明基板上の非表示領域を互いに対向する基板の外側に張り出させ、その領域に各基板の透明電極に対して信号を供給する駆動用ＩＣをそれぞれ実装し、各駆動用ＩＣの端子と各透明電極とを引き廻し配線を用いて電気的に接続する構成が採用されていた。

【０００４】ところがその後、液晶表示パネルの狭額縁化、駆動用ＩＣの使用数の削減等を目的として、画素数がそれ程多くない小規模のパネルの場合には、２枚の透明基板上の全ての電極を一方の基板上の非表示領域に設けた多数の引き廻し配線に導通させ、これら引き廻し配線に接続した１個の駆動用ＩＣで駆動する方式が提案された。図３７、図３８はこの方式の液晶表示装置の構成例を示している。

【０００５】図３７はチップ部品をフィルム（可撓性）基板上に実装したいわゆるＣＯＦ（Chip On Film）実装と呼ばれる形態の回路基板を液晶表示パネルに接合したものであり、下側基板１００の一辺側が上側基板１０１の外側に張り出しており、この部分に１個の駆動用ＩＣ１０２が搭載されたフレキシブルプリント配線基板１０３（Flexible Printed Circuit，以下、ＦＰＣと略記する）が電気的に接合されている。下側基板１００および上側基板１０１の対向面には互いに直交する方向に多数のストライプ状電極１０４，１０５が形成されている。

【０００６】図３８はチップ部品をガラス基板上に実装したいわゆるＣＯＧ（Chip On Glass）実装と呼ばれる形態のものであり、下側基板（ガラス基板）１１０の一辺側が上側基板１１１の外側に張り出しており、この部分に駆動用ＩＣ１１２が直接搭載され、さらに駆動用ＩＣ１１２に駆動信号を供給するためのＦＰＣ１１３が電気的に接合されている。

【０００７】いずれの形態にしても、下側基板の電極用の引き廻し配線と上側基板の電極用の引き廻し配線は全て、ＦＰＣや駆動用ＩＣが実装された下側基板の一辺側に集められている。

【０００８】液晶表示パネルを構成する上側基板、下側基板の引き廻し配線の接続構造の一例を図３９、図４０を用いて詳細に説明する。図３９は上側基板１２０の電極および引き廻し配線の配置を示す平面図であり、図４０は下側基板１３０の電極および引き廻し配線の配置を示す平面図である。図３９に示すように、上側基板１２０においては、図中横方向に延在する短冊状の走査電極１２１がストライプ状に多数配置されている。ここで、多数の走査電極１２１が形成された領域が液晶表示装置としての表示領域１２２となる。そして、表示領域１２２の外方（図中表示領域１２２の右側と左側）の非表示領域に、各走査電極１２１に信号を供給するための走査電極用引き廻し配線１２３がそれぞれ配置されている。この引き廻し配線１２３は電極の延在方向に引き出された後、屈曲して上側基板１２０の一辺側（図中下側の辺）の両端部に集められている。

【０００９】一方、図４０に示すように、下側基板１３０においては、上側基板１２０に形成された走査電極１２１と直交する方向（図中縦方向）に延在する短冊状の信号電極１３１がストライプ状に多数配置されている。そして、表示領域１２２の外方（図中表示領域１２２の下側中央部）の非表示領域に、各信号電極１３１に信号を供給するための信号電極用引き廻し配線１３２がそれぞれ配置されている。また、これら信号電極用引き廻し配線１３２が配置された領域の両側方に、上側基板１２０の走査電極用引き廻し配線１２３と電気的に接続するための走査電極用引き廻し配線１３３が走査電極１２１の数と同数、配置されている。また、この走査電極用引き廻し配線１３３のピッチは上側基板１２０の走査電極

用引き廻し配線１２３のピッチと一致している。なお、本構成例においては、全ての引き廻し配線１２３，１３２は走査電極１２１もしくは信号電極１３１と一体に形成されており、インジウム錫酸化物（Indium Tin Oxide，以下、ＩＴＯと略記する）等の透明導電膜で形成されている。

【００１０】前記構成の上側基板１２０と下側基板１３０を貼り合わせると、下側基板１３０の外形よりも上側基板１２０の外形の方が小さく、上側基板１２０上の走査電極用引き廻し配線１２３の下端と下側基板１３０上の走査電極用引き廻し配線１３３の上端とが、図中符号１３４で示す上下導通部で対向するように位置する。上下導通部１３４には例えば異方性導電膜、導電ペースト、導電性粒子を含む導電材等が設けられており、これを介して上側基板１２０上の走査電極用引き廻し配線１２３と下側基板１３０上の走査電極用引き廻し配線１３３とが電気的に接続される。このようにして、全ての走査電極用引き廻し配線１３３と全ての信号電極用引き廻し配線１３２が下側基板１３０の一辺側に集められたことになるので、この部分に例えば図３７に示したようなＣＯＦ実装された基板との接続を行えば、ＣＯＦ実装基板上の１個の駆動用ＩＣから全ての走査電極１２１と信号電極１３１に対して信号を供給することができる。

【００１１】

【発明が解決しようとする課題】しかしながら、前記構成の液晶表示装置には、以下のような問題点があった。すなわち、従来の液晶表示装置を構成する基板には、前記のように表示領域の外側に引き廻し配線を形成する領域が必ず必要になる。上述したように、近年の液晶表示装置においては表示容量がますます増加する傾向にあるが、表示容量（画素数）が増加する程、この引き廻し配線の本数が増えて引き廻し配線の形成領域が広くなってしまうため、これが狭額縁化の障害となる。

【００１２】表示容量を増やしても引き廻し配線形成領域が広くならないようにするには、引き廻し配線のピッチ（配線幅＋配線間隔）を小さくすることも考えられるが、その場合、引き廻し配線抵抗の増大を招き、表示品質に悪影響を与える恐れがある。例えば１００本の引き廻し配線を５０μｍピッチで形成する場合、５ｍｍ程度の引き廻し配線形成領域が必要になる。この時の引き廻し抵抗は数ｋΩ～ＭΩオーダーにまで達し、信号波形なまりなどの問題が生じる場合がある。

【００１３】引き廻し配線の抵抗増大を抑えるためには、引き廻し配線を構成する透明導電膜の低抵抗化、低抵抗の金属補助配線の付加等の方法がある。しかしながら、前者の方法の場合、透明導電膜は電極の部分では充分な光透過率を確保することが重要であり、高い透過率を維持したままでの低抵抗化は困難である。また、後者の方法の場合は、製造工程の負荷が増大するという問題がある。結局のところ、引き廻し配線の抵抗を増大させることなく、引き廻し配線形成領域の縮小化を図る有効な手段は今まで存在しなかった。

【００１４】また、図３７、図３８に示したように、従来の液晶表示装置ではＦＰＣや駆動用ＩＣを実装する領域が必要なため、一方の基板を他方の基板から大きく張り出させなければならず、液晶表示装置を電子機器の筐体内に収容する場合、この部分が無駄な空間となっていた。そのため、液晶表示装置の非表示（額縁）領域の確保、及び拡大に繋がっていた。

【００１５】なお、液晶表示装置の狭額縁化を目的として、基板の裏面側に電子回路および駆動用ＩＣを搭載する技術が特開平５－３２３３５４号公報に開示されている。同様に、一方の基板に画素パターン配線基板と駆動回路配線基板としての機能を兼用させる技術が特開平７－１５９８０２号公報に開示されている。しかしながら、この公報には、ただ単に一方の基板の表面側の駆動線をビアホール（コンタクトホール）を介して裏面側に導通させ、裏面側の駆動回路および駆動用ＩＣに接続することが記載されているだけであって、液晶表示装置の全体構成は不詳である。

【００１６】本発明は、前記の課題を解決するためになされたものであって、引き廻し抵抗の増大などによる表示品質の低下を招くことなく、狭額縁化による小型化を図ることができる液晶装置の製造方法、およびこの製造方法により得られた液晶装置とこれを用いた電子機器を提供することを目的とする。

【００１７】

【課題を解決するための手段】前記の目的を達成するために、本発明の液晶装置の製造方法は、互いに対向してシール材によって貼り合わされた一対の基板間に液晶層が挟持され、前記一対の基板のうち第１の基板には、前記液晶層に面する側の内面上に第１の導電部が設けられ、該第１の導電部と電気的に接続されるとともに前記第１の基板内部を介して前記内面上から該内面と反対側の外面上に電気的に接続される第１の引き廻し導電部が形成され、前記一対の基板のうち第２の基板には、前記液晶層に面する側の内面上に第２の導電部が設けられ、前記一対の基板間での上下導通により前記第２の導電部と電気的に接続されるとともに前記第１の基板内部を介して更に前記第１の基板の内面上から該内面と反対側の外面上に電気的に接続される第２の引き廻し導電部が形成され、前記第１の基板の外面上には前記第１の引き廻し導電部および／または前記第２の引き廻し導電部と電気的に接続された電子部品が実装された液晶装置の製造方法であって、前記第１の基板と前記第２の基板とを前記第１の導電部と第２の導電部とが互いに内面で対向するように前記シール材を介し貼り合わせるとともに、前記第２の引き廻し導電部において前記一対の基板間での前記上下導通を行う基板貼り合わせ工程後、前記第１の基板の外面上に前記電子部品を実装し、前記第１の引き

廻し導電部および／または前記第２の引き廻し導電部と電気的に接続する実装工程を備えたことを特徴とする。

【００１８】本発明の液晶装置の製造方法では、第１の基板の外面側に、第１の基板内面の第１の導電部および第２の基板内面の第２の導電部と電気的に接続された電子部品を実装している。ここで言う「第１の導電部」、「第２の導電部」とは、具体的にはパッシブマトリクス型液晶装置における走査電極、信号電極等の電極、もしくはアクティブマトリクス型液晶装置における走査線、データ線等の配線のことを指す。また、「電子部品」とは、具体的には液晶装置の駆動回路に用いる駆動用ＩＣ、コンデンサ等のことを指す。

【００１９】詳細には、第１の導電部を、第１の基板の内面から基板内部を通り第１の基板の外面にわたって設けられた第１の引き廻し導電部を介して電子部品に電気的に接続している。一方、第２の導電部を、第２の基板の内面から基板間をわたって第１の基板の内面へ、さらに第１の基板の内面から基板内部を通り第１の基板の外面にわたって設けられた第２の引き廻し導電部を介して電子部品に電気的に接続している。

【００２０】よって、従来の液晶装置の構成で言えば、引き廻し配線が第１の基板の内面上の電極形成領域（言い換えると表示領域）の外側の領域（非表示領域）に引き廻されていたのに対し、本発明の製造方法で製造された液晶装置では、引き廻し導電部（引き廻し配線）が第１の基板の内面側から基板内部を通って外面側に引き廻されている。

【００２１】したがって、本発明の製造方法で製造された液晶装置の構成によれば、従来の液晶装置の構成において第１の基板内面の表示領域外側に設けていた引き廻し領域が不要となるので、その分だけ従来に比べて大幅に額縁部分を狭くすることができる。また、表示領域内を含めて第１の基板の外面側全面に引き廻し導電部をレイアウトすることができ、引き廻し導電部間のピッチを余裕を持って設計することができるため、引き廻し抵抗が増大するという問題が生じることもない。また、このように引き廻し導電部の低抵抗化によりクロストークの発生を改善でき、表示品位を向上できる。

【００２２】また、表示容量の増加に伴って引き廻し導電部（引き廻し配線）の本数を多くしても、上述したように引き廻し導電部を第１の基板の外面側全面にレイアウトすることができるので、引き廻し領域を第１の基板内面の表示領域外側に設けていた従来の液晶装置と比べて、引き廻し導電部の線幅およびピッチを余裕を持って設計することができ、引き廻し導電部の断線等の不良が発生し難い。

【００２３】また、本発明の製造方法において第１の基板の外面側に電子部品を実装する場合には、この製造方法により得られた液晶装置の第１の基板は、液晶装置そのものを構成する一方の基板として機能すると同時に、駆動回路の搭載基板としても機能する。したがって、場合によっては、フレキシブルテープ等の接続用部品の削減を図ることもでき、さらに部品数の削減によるコストダウンおよび液晶装置の小型化が可能である。また、第１の基板の外面側に電子部品が実装された液晶装置を得ることもできるので、対向する第１と第２の基板の端面や周囲に電子部品やこれと接続されたＦＰＣが付いてないため、従来の液晶表示装置のように一方の基板を他方の基板より大きく張り出させてＣＯＦ実装したものやＣＯＧ実装したものと比べて、電子機器に取り付ける際に取り扱い易い。

【００２４】さらに、本発明の製造方法では、第１の基板の外面側に電子部品を実装する前に、各導電部と引き廻し導電部が形成された第１と第２の基板をシール材を介して貼り合わしているので、電子部品の実装工程前に、第１と第２の基板の第１と第２の引き廻し導電部とパネル検査機を接続しパネル特性の良否を評価し、合格したものだけに電子部品を実装するようにすれば、不良の液晶パネルに電子部品を実装しなくても済み、コストの削減が可能である。

【００２５】また、前記のように本発明により製造された液晶装置は前記のように小型化できるので、電子機器の小型化および低価格化を実現できる。

【００２６】なお、本発明の第２の引き廻し導電部は、前記第１の基板の内面から基板内部を通り前記内面と反対の外面にかけて形成した第２の引き廻し導電部の第１の部分と、第２の基板の内面から基板間をわたって第１の基板の内面にかけて形成した第２の引き廻し導電部の第２の部分とから構成され、第２の引き廻し導電部の具体的な構成は、第２の引き廻し導電部の第２の部分は、第１の基板と第２の基板との間に設けられ第２の導電部と電気的に接続された基板間接続部から構成され、第２の引き廻し導電部の第１の部分は、第１の基板の内面側と外面側との間に設けられた孔の内部に設けられ、前記基板間接続部と電気的に接続された第２の孔内接続部と、前記第１の基板の外面上において第２の孔内接続部と電子部品とを電気的に接続する第２の外面上接続部とを有する構成とすることができる。

【００２７】また、第１の基板における第１の引き廻し導電部の具体的な構成は、第１の基板の内面側と外面側との間に設けられた孔の内部に設けられ、第１の導電部と電気的に接続された第１の孔内接続部と、第１の基板の外面上において第１の孔内接続部と電子部品とを電気的に接続する第１の外面上接続部とを有する構成とすることができる。

【００２８】また、本発明の液晶装置の製造方法は、さらに前記第１の基板の内面側に光反射部を設け、前記第２の基板の外面側に偏光手段を設けることにより反射型液晶装置を製造する場合に適用することもでき、その場合に引き廻し導電部を第１の基板外面側に引き廻した後

は平面的に表示領域に相当する領域内に配線を形成しても表示上何ら支障はない。また、これらの配線に電気的に接続される電子部品も同様に第１の基板外面の表示領域に相当する領域内に配置することができる。しかも、本発明の製造方法で製造された液晶装置の引き廻し導電部の基本構成は、電子部品が実装された側の基板である第１の基板上の第１の引き廻し導電部のみならず、液晶層を挟んで対峙する第２の基板からの第２の引き出し導電部についても同様である。すなわち、一対の基板の全ての引き廻し導電部が第１の基板の内部を通って最終的に第１の基板の外面側に引き廻され、電子部品に接続される構成になっている。

【００２９】また、本発明の液晶装置の製造方法は、第１、第２の引き廻し導電部としてともに透光性を有する導電材料から構成し、さらに前記第１の基板の外面側および前記第２の基板の外面側にそれぞれ偏光手段を設けることにより透過型液晶装置を製造する場合に適用することもでき、その場合に引き廻し導電部を基板外面側に引き廻した後はこれを表示領域内に配置すれば表示上何ら支障はない。つまり、一対の基板の全ての引き廻し導電部が第１の基板の内部を通って第１の基板の外面側に引き廻しており、第１の基板の外面に対して例えばＣＯＦ実装を行えば、ＣＯＦ上の１個の駆動用ＩＣから第１、第２の導電部全てに対して信号を供給することができる。

【００３０】本発明の液晶装置の製造方法により製造できる液晶装置の方式としては、例えば、パッシブマトリクス型液晶装置、スイッチング素子に薄膜ダイオード（ThinFilm Diode，以下、ＴＦＤと略記する）を用いたアクティブマトリクス型液晶装置、スイッチング素子に薄膜トランジスタ（Thin Film Transistor，以下、ＴＦＴと略記する）を用いたアクティブマトリクス型液晶装置などが挙げられる。

【００３１】また、本発明の液晶装置に製造方法においては、前記第２の基板と貼り合わせ前の第１の基板の外面に、少なくとも第１の引き廻し導電部と第２の引き廻し導電部を覆う第１の保護層を形成する工程が備えられることが望ましい。

【００３２】このような第１の保護層の形成工程が備えられると、第１と第２の基板をシール材を介して貼り合わせる際には、通常、シール材を介して対向させた第１と第２の基板を定盤上に配置後圧力をかけて一体化しているので、このときに前記のような第１の保護層が形成されていると、第１の基板の外面側の第１の引き廻し導電部と第２の引き廻し導電部に傷が付いたり汚染されることがなく、コンタクト不良を防止でき、さらにこの第１の保護層は絶縁も兼ねることができるので、導電性の塵等の付着によるショートを防止できる。また、第１の基板の内面側の第１の導電部を外面側の第１の引き廻し導電部や第２の引き廻し導電部の第１の部分形成後に形成する場合や第１の基板の内面側に配向膜等を形成する場合に、第１の導電部のパターニング工程や配向等の形成工程で使用する有機溶剤等の薬液で第１の基板の外面側の第１の引き廻し導電部と第２の引き廻し導電部が腐食するのを防止できる。また、この第１の保護層は前記したように絶縁も兼ねることができるので、取り扱い易く、電子機器に組み込み易い。

【００３３】また、第１の基板の外面側に第１の引き廻し導電部や第２の引き廻し導電部の第１の部分が形成されているだけでは、第１の基板の外面側は凹凸を有するが、特に第１の基板として可撓性を有する基板を用いた場合に、この第１の基板に基板貼り合わせ工程等で熱がかかった際に基板と導電部との熱膨張率の違いにより外面側に生じた凹凸により内面側に凹凸が生じ、これにより基板間の間隔にばらつきが生じ、表示品質に影響がでる恐れがある。これに対して前記第１の保護層を第１の基板の外面側の全面に形成する場合には、第１の基板の外面側を平坦化できるので、特に第１の基板として可撓性を有する基板を用いた場合に、この第１の基板に基板貼り合わせ工程等で熱がかかっても第１の基板の外面側に凹凸が生じるのを防止でき、基板間の間隔にばらつきが生じるのを防止でき、セル厚を均一にでき、得られる液晶装置の表示品質を向上できる。

【００３４】また、前記第１の保護層を第１の基板の外面側の全面に形成する場合には、第１の基板の外面を平坦とすることができるので、第１と第２の基板を定盤上に配置して一体化する際に、表面が平坦な通常の定盤を使用できる上、第１と第２のの基板に均等に圧力をかけることができ、得られる液晶装置の品質を向上できる。

【００３５】また、前記電子部品の実装工程前に、前記第１の保護層を部分的に剥離する工程を備えることが望ましい。

【００３６】このような第１の保護層の部分的剥離工程が備えられると、電子部品と接続する第１の引き廻し導電部の端子部上と第２の引き廻し導電部の端子部上の第１の保護層を部分的に剥離して端子部を露出させることができ、電子部品はこの露出した第１と第２の引き廻し導電部の各端子部と接続すればよく、しかもこれら端子部以外の第１の引き廻し導電部および第２の引き廻し導電部は第１の保護層で覆われているので、傷が付いたり、導電性の塵等が付着するのを防止できる。また、この第１の保護層の部分剥離工程では、パネル検査機と接続して第１と第２の基板の特性（パネルの特性）を調べるために、電子部品と接続する第１と第２の引き廻し導電部の端子部上以外の第１の保護層も部分的に剥離してもよい。

【００３７】また、前記前記第１の保護層の部分的剥離工程と、前記電子部品の実装工程の間に、前記基板貼り合わせ工程で貼り合わした第１と第２の基板の検査工程を備えることが望ましい。

【００３８】このような第１と第２の基板の検査工程が備えられると、第１の保護層の部分剥離工程において部分的に露出された第１と第２の引き廻し導電部とパネル検査機を接続しパネル特性の良否を評価し、合格したものだけに電子部品を実装するようにすれば、不良のパネルに電子部品を実装しなくても済み、コストの削減が可能である。

【００３９】また、前記電子部品の実装工程において、前記第１の基板に予め形成した凹部に前記電子部品の少なくとも一部を埋め込むようにしてもよい。その場合に用いられる第１の基板の材質としては、ガラス基板やガラス強化プラスチック基板が好適に用いられる。

【００４０】さらにまた、前記電子部品の実装工程の後に、第１の基板の外面側に少なくとも前記電子部品と第１と第２の引き廻し導電部との接続部を覆う第２の保護層を形成する工程を備えることが望ましい。このような第２の保護層を形成する工程が備えられると、液晶装置の第１の基板の外面側の第１と第２の引き廻し導電部と電子部品の接続部が第２の保護層で保護できるので、この接続部に傷が付いたり、汚染されるのを防止でき、また、この第２の保護層は絶縁も兼ねることができるので、取り扱い易く、電子機器に組み込み易い。また、第２の保護層を第１の基板の外面側の全面に形成する場合には、第１の基板の外面側を平坦化できるので、より取り扱い易くなる。

【００４１】本発明の製造方法では、前記第１の基板および／または前記第２の基板として可撓性を有する基板を用いてもよい。第１および第２の基板として可撓性を有する基板を用いると、この製造方法により得られる液晶装置の薄型化、軽量化が図れる、基板の割れ等の破損が生じにくくなる、基板を湾曲させることで曲面表示が可能になる、等の利点が得られ、携帯機器等の電子機器に好適な液晶装置を製造できる。また、第１の基板が可撓性を有する基板であると、この第１の基板に例えばレーザー加工、ケミカルエッチング等の操作を施すことにより容易にスルーホールを形成することができる。さらに、このスルーホール内への銀ペースト等の充填、電解メッキ等を施すことにより、スルーホール内に導電性材料からなる第１の引き廻し導電部の一部（第１の孔内接続部）や第２の引き回し導電部の第１の部分の一部（第２の孔内接続部）を形成することができる。

【００４２】一方、第１の外面上接続部や第２の外面上接続部は、導電膜の成膜、パターニング等の通常の配線形成技術によって容易に形成することができ、また、基板間接続部は、シール材に導電材を混入する等の方法により設けることができる。

【００４３】従って、前記方法により第１の孔内接続部を形成することにより、この第１の孔内接続部を介して第１の導電部と第１の外面上接続部を電気的に接続でき、前記の方法により第２の孔内接続部を形成することにより該第２の孔内接続部と基板間接続部を介して第２の導電部と第２の外面上接続部を電気的に接続できるので、第１と第２の基板の全ての引き廻し導電部が第１の基板の内部を通って第１の基板の外面側に引き廻すことができ、さらに、この第１の基板の外面側に電子部品を実装することで、第１の基板を液晶装置そのものを構成する一方の基板として機能させると同時に、駆動回路の搭載基板としても機能させることができる。

【００４４】また、第１の基板としては、内面側の第１の導電部、外面側の第１の引き廻し導電部（第１の外面上接続部）の他、基板内部に１層以上の内部導電部（内部導電層）を有する基板、いわゆる多層プリント配線基板のような基板を用いてもよい。この場合には、第１の基板の内面から外面にわたる孔は、第１の基板の内面と内部導電部との間、第１の基板の外面と内部導電部との間、もしくは相互の内部導電部の間に設けられた複数のビアホールから構成されるものとなる。

【００４５】この種の基板を用いると、例えば引き廻し導電部の数が増え、第１の基板の外面上だけに多数の引き廻し導電部を配置するのが難しくなった場合に、一部の引き廻し導電部を内部導電部を用いて引き廻すこともでき、引き廻しの自由度が向上するので、表示容量を増大させた液晶装置の製造に対応することが可能になる。

【００４６】また、第１の基板としては、外面側の第１の引き廻し導電部（第１の外面上接続部）を有する構成の場合、内面側の第１の導電部と外面側の引き廻し導電部（第１の外面上接続部）を同じ導電性材料で構成したものを用いてもよい。

【００４７】この構成にすると、第１の基板の内面側と外面側に導電膜を成膜した後、内面側と外面側の両面にフォトリソグラフィー、エッチングを施し、両面の導電膜を同時にパターニングして第１の導電部と第１の外面上接続部を形成することができるので、製造工程の簡略化を図ることができる。

【００４８】また逆に、第１の基板としては、内面側の第１の導電部と外面側の第１の引き廻し導電部（第１の外面上接続部）を異なる導電性材料で構成したものを用いることもできる。

【００４９】この構成においては、後述するように第１の導電部、例えばパッシブマトリクス型液晶装置における電極が光反射部を兼ねる場合、第１の導電部には光反射率の高い銀（又は銀を含有する合金）、アルミニウム等の金属材料を用い、第１の外面上接続部には引き廻し抵抗低減のために低抵抗材料である銅等の金属材料を用いるというように、第１の導電部、第１の外面上接続部各々の機能に最適な導電材料を選択することができる。その結果、製造工程の簡略化という前記の利点は得られない代りに、得られる液晶装置の表示品質を高めることができる。

【００５０】また、本発明の液晶装置の製造方法におい

ては、前記電子部品の実装工程において、第１の基板の外面上であって、非表示領域に対応する部分に前記電子部品を実装することが望ましい。ここでいう「非表示領域」とは、第１の基板の電極形成領域（言い換えると表示領域）の外側の領域、あるいは第１と第２の基板間のシール材形成位置より外側の領域（シール材と同じ位置も含む）、あるいは前記シール材より僅かに液晶層側に入った位置より外側の領域のことを指す。

【００５１】第１の基板の外面側に電子部品を実装する際、第１の基板に局所的に熱がかかる場合があるが、電子部品の実装位置が非表示領域であれば、表示領域内に実装する場合と比べて表示領域が小さくなるが、実装時の熱により表示領域に悪影響を及ぼすのを回避でき、表示ムラ等の発生を防止する効果が優れる。また、第１の基板が可撓性を有する基板である場合には、電子部品の実装時の熱により第１の基板に凹凸が生じる場合があるが、電子部品の実装位置が非表示領域であれば、前記凹凸が表示に悪影響を及ぼすことを回避でき、表示品質を保つことができる。

【００５２】また、本発明の液晶装置の製造方法においては、前記基板貼り合わせ工程において前記第１の基板として、外面側周縁部に前記駆動用ＩＣ等の電子部品の入力端子と電気的に接続される外部接続端子が設けられたものを用いることが望ましい。このような外部接続端子を第１の基板の外面側周縁部に設けておけば、駆動用ＩＣに駆動信号を供給するためのＦＰＣなどをさらに実装するような場合、外部接続端子とＦＰＣの端子を接合する際の位置合わせを容易に行うことができる。また、ＦＰＣ接合時もしくは接合後、接合部分に応力が発生する場合があるが、その位置が表示領域から外れた基板周縁部であれば、前記応力が表示に悪影響を及ぼすこともない。

【００５３】また、本発明の液晶装置の製造方法においては、前記基板貼り合わせ工程において前記第１の基板として外面側周縁部に前記第１の引き廻し導電部および前記第２の引き廻し導電部と電気的に接続された外部接続端子が設けられたものを用いることが望ましい。このような外部接続端子を第１の基板の外面側周縁部に設けておけば、ＣＯＦなどを実装するような場合、外部接続端子とＣＯＦの端子を接合する際の位置合わせを容易に行うことができる。また、ＣＯＦ接合時もしくは接合後、接合部分に応力が発生する場合があるが、その位置が表示領域から外れた基板周縁部であれば、前記応力が表示に悪影響を及ぼすこともない。

【００５４】また、前記の目的を達成するために、本発明の液晶装置は、互いに対向配置された一対の基板間に液晶層が挟持された液晶装置であって、前記一対の基板のうち、第１の基板においては前記液晶層に面する内面上に第１の導電部が設けられるとともに、該第１の導電部と電気的に接続された第１の引き廻し導電部が前記内面から基板内部を通り前記内面と反対側の外面にわたって設けられ、透光性を有する第２の基板においては前記液晶層に面する内面上に第２の導電部が設けられるとともに、該第２の導電部と電気的に接続された第２の引き廻し導電部が前記第２の基板の内面から前記第１の基板の内面へ、さらに第１の基板の内面から基板内部を通り第１の基板の外面にわたって設けられ、前記第１の基板の外方又は外面側には前記第１の引き廻し導電部および前記第２の引き廻し導電部と電気的に接続された電子部品が実装され、前記第１の基板の外面側には少なくとも第１の引き廻し導電部と第２の引き廻し導電部を覆う第１の保護層が設けられたことを特徴とする。

【００５５】本発明の液晶装置の構成によれば、表示領域内を含めて第１の基板の外面側全面に引き廻し導電部をレイアウトすることができ、引き廻し導電部間のピッチを余裕を持って設計することができるため、引き廻し抵抗が増大するという問題が生じることもなく、また、表示容量の増加に伴って引き廻し導電部の本数を多くしても、引き廻し導電部の線幅およびピッチを余裕を持って設計することができ、引き廻し導電部の断線等の不良が発生し難い。また、このように引き廻し導電部の低抵抗化によりクロストークの発生を改善でき、表示品位を向上できる。

【００５６】また、第１の基板の外面側には少なくとも第１と第２の引き廻し導電部を覆う第１の保護層が形成されているので、第１の基板の外面側の第１の引き廻し導電部と第２の引き廻し導電部に傷が付いたり汚染されることがなく、コンタクト不良を防止でき、さらに、前記保護層は絶縁も兼ねることができるので、導電性の塵等の付着によるショートを防止でき、また、取り扱い易く、電子機器に組み込み易い。また、第１の保護層が第１の基板の外面側の全面に形成されている場合には、第１の基板の外面側を平坦化できるので、より取り扱い易くなる。

【００５７】前記第１の基板の外面側に実装された電子部品は、少なくとも一部が前記第１の基板に埋め込まれていてもよい。

【００５８】前記電子部品が実装された第１の基板の外面側には少なくとも前記電子部品と第１と第２の引き廻し導電部との接続部を覆う第２の保護層が設けられていることが望ましい。

【００５９】この構成によれば、液晶装置の第１の基板の外面側の第１と第２の引き廻し導電部と電子部品の接続部が第２の保護層で保護されているので、この接続部に傷が付いたり、汚染されるのを防止でき、また、この第２の保護層は絶縁も兼ねることができるので、取り扱い易く、電子機器に組み込み易い。また、第２の保護層を第１の基板の外面側の全面に形成した場合には、第１の基板の外面側が平坦化されるので、より取り扱い易くなる。

【００６０】前記第１の基板および／または前記第２の基板が可撓性を有する基板で構成されていてもよい。

【００６１】この構成にすると 、液晶装置の薄型化、軽量化が図れる、基板の割れ等の破損が生じにくくなる、基板を湾曲させることで曲面表示が可能になる、等の利点が得られ、携帯機器等の電子機器に好適なものとなる。

【００６２】前記第１の基板の外面上であって、非表示領域に対応する部位に、前記電子部品が実装されていることが望ましい。

【００６３】この構成にすると、前記電子部品を表示領域内に実装する場合と比べて表示領域が小さくなるが、実装時の熱により表示領域に悪影響を及ぼすのを回避でき、表示ムラ等の発生の防止効果が優れる。また、第１の基板が可撓性を有する基板である場合には、電子部品の実装時の熱により第１の基板に凹凸が生じる場合があるが、電子部品の実装位置が非表示領域であるので、前記凹凸が表示に悪影響を及ぼすのを回避でき、表示品質を保つことができる。

【００６４】本発明の電子機器は、前記のいずれかの構成の本発明の液晶装置を備えたことを特徴とする。本発明の電子機器によれば、狭額縁化による小型の液晶装置を備えたことによって、装置全体が小型である割に表示領域が広く、携帯性に優れた電子機器を実現することができる。

【００６５】

【発明の実施の形態】［第１の実施の形態］以下、本発明の液晶装置の製造方法の第１の実施の形態で得られた液晶装置を図１～図１３を参照して説明する。

【００６６】本実施の形態は、本発明の液晶装置の製造方法をパッシブマトリクス型液晶表示装置の製造方法に適用した例であって、光反射部を兼ねた表示電極、いわゆる反射電極を有する液晶表示装置の製造例である。

【００６７】図１は本実施の形態で得られた液晶表示装置全体を上面側から見た斜視図、図２は下面側から見た斜視図、図３は下側基板の上面（電極形成面）図、図４は下側基板を下面側から観た透過平面図（電子部品の実装面側から観た透過平面図）、図５は上側基板の下面（電極形成面）図、図６は上側基板と下側基板を重ね合わせた状態を示す透過平面図、図７は図６のＡ－Ａ’線に沿う断面図、図８は図６のＢ－Ｂ’線に沿う断面図である。なお、以下の全ての図面においては、各層や各部材を図面上で認識可能な程度の大きさとするため、各層や各部材毎に縮尺を異ならせてある。

【００６８】本実施の形態の製造方法で得られた液晶表示装置１は、図１に示すように、下側基板２（第１の基板）と上側基板３（第２の基板）とが対向配置され、これら基板間に液晶層（図１では図示略）が挟持されている。本実施の形態では、下側基板２としてポリイミド等からなる不透明基板が用いられ、上側基板３としてポリカーボネート、ポリエーテルスルホン、アクリル系樹脂等からなる透明基板が用いられている。以下の説明では、双方の基板の液晶層に面する側の面を「内面」、それと反対側の面を「外面」という。即ち、双方の基板において液晶層が配置される側の面を「内面」、それと反対側の面を「外面」という。また、上側基板３の外面側に、位相差板４（λ／４板）、偏光板５（偏光手段）が順次貼着されている。なお、図２以降の図面では、位相差板４、偏光板５の図示を省略する。

【００６９】下側基板２の内面上には多数の信号電極６（第１の導電部）がストライプ状に設けられ、それと対向する上側基板３の内面上には信号電極６と直交する方向に延在する多数の走査電極７（第２の導電部）がストライプ状に設けられている。そして、信号電極６と走査電極７が交差する部分が個々の画素８となり、多数の画素８がマトリクス状に配列した領域が表示領域９となる。なお、本実施の形態では下側基板２側の電極を信号電極、上側基板３側の電極を走査電極として説明するが、これは逆であっても一向にかまわない。

【００７０】図２に示すように、下側基板２の外面上において、平面的に表示領域９に対応する領域内に、駆動用ＩＣ１０（電子部品）が実装されている。この駆動用ＩＣ１０は、外部回路（図示せず）から外部接続端子２６を通じて入力された信号を受けて信号電極６に対しては画像信号を、走査電極７に対しては走査信号を供給するものである。また、下側基板２の外面上には、後述する信号電極用引き廻し配線（第１の引き廻し導電部）の一部を構成する信号電極用接続配線１２（第１の外面上接続部）、および走査電極用引き廻し配線（第２の引き廻し導電部）の第１の部分の一部を構成する走査電極用接続配線１４（第２の外面上接続部）がそれぞれ配設されており、駆動用ＩＣ１０（図２、図４は図示省略）の端子と電気的に接続されている。

【００７１】図３に示すように、下側基板２の内面上に、アルミニウムや銀（又は銀を含有する合金）などの光反射率の高い金属薄膜からなる多数の信号電極６がストライプ状（帯状）に設けられている。これら信号電極６は反射層を兼ねており、表示時には偏光板５、位相差板４を介して上側基板３の外方から入射し、液晶層を透過した光が下側基板２の内面に達してこれら信号電極６の表面で反射し、画像表示がなされるようになっている。信号電極６の一端はそのまま電極の延在方向に細く延び、その先端が円形に形成され、後述する孔内接続部（第１の孔内接続部）と接続するためのランド１６となっている。ランド１６は下側基板２において信号電極６の延在方向の基板辺に沿って端部に配置されている。ランド１６の中央には、下側基板２の内面、外面間を貫通するスルーホールが形成されている。信号電極６の端部のこの部分が、信号電極６と駆動用ＩＣ１０とを電気的に接続する信号電極用引き廻し配線の一部を構成する信

号電極用接続配線１８となる。

【００７２】本実施の形態の場合、信号電極用接続配線１８は、図３における最上部の信号電極６から順に、信号電極６の左側、右側、左側、…というように交互に反対側の領域に引き出されているため、上下方向に隣接する接続配線間の間隔が広く、接続配線同士が短絡しにくく信頼性が確保されている。しかしながら、特に接続配線間の間隔等に問題がなければ、全ての接続配線を同方向に引き出したり、例えば上側半分の接続配線を左側、下側半分の接続配線を右側と分けて引き出すなど、接続配線の引き出し方向は任意で良い。また、スルーホールを直線的に配置するのではなく、ジグザク（千鳥配列）に配置することで狭ピッチにも対応可能になる。さらに、特に接続配線として信号電極６よりも細い部分を作らなくても、単に信号電極６の端部にスルーホールを設けた構成でも良い。

【００７３】また、下側基板２においてランド１６が端部で配置された基板辺と隣接する他の一方の基板辺の端部には、後述する上下導通部（基板間接続部）と孔内接続部（第２の孔内接続部）との間を電気的に接続する多数の走査電極用接続配線２１（第２の内面上接続部）が形成されている。これら走査電極用接続配線２１は上側基板３の各走査電極７とランド２２で上下基板間の上下導通により電気的に接続されるものである。本実施の形態の場合、各走査電極用接続配線２１の一端は上下導通部に接する矩形のランド２２、他端は孔内接続部に接する円形のランド２３となっており、円形のランド２３の中央には下側基板２の内面、外面間を貫通するスルーホールが形成されている。これら走査電極用接続配線２１も信号電極６と同じアルミニウムなどの材料で形成されている。

【００７４】図４は、図３に示す下側基板２を裏返した状態を示している。下側基板２の外面上には、図３に示した信号電極用接続配線１８のランド１６の中に形成されたスルーホール、走査電極用接続配線２１のランド２３の中に形成されたスルーホールの位置に対応して円形のランド２４，２５がそれぞれ設けられている。更に下側基板２の外面上には、信号電極用接続配線１８のランド１６の中に形成されたスルーホールに対応する各ランド２４から駆動用ＩＣ１０の実装領域に向けて信号電極用接続配線１２がそれぞれ設けられ、同様に走査電極用接続配線２１のランド２３の中に形成されたスルーホールに対応する各ランド２５から駆動用ＩＣ１０の実装領域に向けて走査電極用接続配線１４が設けられている。

【００７５】下側基板２の周縁部の４辺（四つの基板辺）のうち、３辺（三つの基板辺）に沿って前記多数のランド２４，２５が配置されており、上側基板３の内面に形成された走査電極７との電気的接続（上下導通）がなされる基板辺（ランド２５が配置される基板辺）と対向する残りの１辺に沿って多数の外部接続端子２６が形成されている。つまり、下側基板２の外面上に形成される外部接続端子２６は、上側基板３の内面に形成された走査電極７の延在方向に位置する下側基板２の基板辺に沿って端部で配列形成されている。外部接続端子２６は、この液晶表示装置１と駆動用外部回路等をＦＰＣや異方性導電コネクター（又はラバーコネクター）などの接続用部品を用いて接続する際にそのＦＰＣの端子と接続するための端子である。そして、これら外部接続端子２６の各々から駆動用ＩＣ１０の実装領域に向けて、駆動用ＩＣ１０に駆動信号を供給するための信号入力用配線４１がそれぞれ設けられている。本実施の形態の場合、下側基板２の外面に形成された信号電極用接続配線１２、走査電極用接続配線１４、外部接続端子２６、信号入力用配線４１等は全て、内面側の信号電極６、各接続配線１８，２１等と同じく、アルミニウムや銀（又は銀を含有する合金）等の材料から形成されている。つまり、上側基板３の内面に形成された走査電極７以外の配線、及び電極は同じ材料から形成されている。

【００７６】なお、下側基板２の外面には、図２と図４の二点鎖線で示す領域、すなわち、駆動用ＩＣ１０の接続領域および外部接続端子２６の形成領域を除く、配線が露出した領域をポリイミド、レジスト等の樹脂からなる第１の保護層８２を形成し、この第１の保護層８２により信号電極用接続配線１２（第１の外面上接続部）および走査電極用接続配線１４（第２の外面上接続部）、信号入力用配線４１等が被覆されていることが望ましい。このような第１の保護層８２を形成すると、信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１等の配線の腐食、断線、ショート等の不具合を防止することができ、また、下側基板２の外面側を平坦化できるので、取り扱い易くなる。

【００７７】図５に示すように、上側基板３の内面上に、ＩＴＯなどの透明導電性薄膜からなる多数の走査電極７がストライプ状（帯状）に設けられている。図５における各走査電極７の長さ方向（配線形成方向）の端部が上下導通部に接続される部分となる。なお、図示しない上側基板３の外面側は何も形成されていない平坦な面となっている。

【００７８】上記構成の下側基板２と上側基板３を重ね合わせると、図６に示すようになる。図６において、２点鎖線で示した符号２７の部材は両基板を接着すると共に液晶層を基板間に封止するためのシール材である。信号電極６と走査電極７が交差する部分が個々の画素８となり、多数の画素８がマトリクス状に配列した領域が表示領域９となる。本実施の形態の場合、下側基板２の外形よりも上側基板３の外形の方が小さく、下側基板２の周縁部は上側基板３の外側にはみ出している。下側基板２の内面上の各信号電極用接続配線１８の先端のランド１６の部分は、それぞれ上側基板３の外側にはみ出して位置している。つまり、各信号電極６から導出される各

信号電極用接続配線１８はシール材の形成部を突き抜け、更に上側基板３の外形（外周）よりも外側に延在して形成され、その先端部分にランド１６が配置されている。一方、下側基板２の内面上の各走査電極用接続配線２１については、上下導通部に接する矩形のランド２２の部分がシール材２７の部分に位置し、スルーホールが設けられた円形のランド２３の部分が上側基板３の外側にはみ出して位置している。

【００７９】図７は図６のＡ－Ａ’線に沿う断面図、すなわち信号電極６に沿った方向に切断した断面図である。この図に示すように、下側基板２と上側基板３との間にシール材２７が挟持され、下側基板２と上側基板３とシール材２７とにより密閉された空間に液晶層２８が挟持されている。ここでは、液晶層２８として例えばＳＴＮ（Super Twisted Nematic）液晶等の一般的な液晶を用いることができる。

【００８０】下側基板２の内面上に信号電極６および信号電極６と一体形成された信号電極用接続配線１８が形成されるとともに、下側基板２の外面上には信号電極用接続配線１２が形成され、双方の信号電極用接続配線１２，１８の先端のランドの部分には基板を貫通するスルーホール１７が形成されている。スルーホール１７の内部には銀ペースト等の導電性材料が充填されており、この導電性材料が、内面側の信号電極用接続配線１８と外面側の信号電極用接続配線１２とを電気的に接続する孔内接続部１５を構成している。

【００８１】ここで、孔内接続部１５のより詳細な構成としては、例えば図１１（ａ）に示すように、スルーホール１７の内部に銀ペースト等の導電性材料を埋め込んで孔内接続部１５を形成した後、導電性材料の表面を絶縁性の樹脂で被覆するなどして被覆層２９を形成すると、導電性材料の腐食を防止することができる。もしくは、図１１（ｂ）に示すように、スルーホール１７の内部に導電性材料を埋め込んで孔内接続部１５を先に形成した後、孔内接続部１５の上面および下面を覆うように下側基板２の内面上および外面上にそれぞれ信号電極用接続配線１８，１２を形成してもよい。

【００８２】もしくは、孔内接続部は、内面側および外面側の信号電極用接続配線同士を電気的に接続できればよいのであって、必ずしも孔の内部全体に埋め込まれていなくてもかまわない。したがって、図１２に示すように、電解メッキ法を用いてスルーホール１７の内壁にのみ導電性材料を付着させ、孔内接続部３０としてもよい。

【００８３】また図７に示すように、下側基板２の外面上に形成された信号電極用接続配線１２のスルーホール１７が設けられた側と反対側の端部には、駆動用ＩＣ１０の端子３１が接続されている。以上のような配線構造を採ることにより、駆動用ＩＣ１０から出力された画像信号は、下側基板２の外面上の信号電極用接続配線１２、孔内接続部１５、下側基板２の内面上の信号電極用接続配線１８を経由して各信号電極６に供給される。よって、これら下側基板２の外面上の信号電極用接続配線１２、孔内接続部１５、下側基板２の内面上の信号電極用接続配線１８が信号電極用引き廻し配線１１を構成することになる。

【００８４】図７に示す駆動用ＩＣ１０の実装形態は、ＩＣの表面（端子形成面）側を基板側に向けた、いわゆるフェイスダウン実装（もしくはＩＬＢ（Inner Lead Bonding）実装）と呼ばれるものであり、例えばマトリクス状に配置された半田ボールが端子３１を構成するＢＧＡ（Ball Grid Array）型半導体素子やバンプ電極をＩＣの外形周辺部に沿って配置された半導体素子などが用いられる。

【００８５】もしくは、図１０に示すように、駆動用ＩＣ３２の裏面側を下側基板２上に固定し、ＩＣ表面側の電極パッド３３と信号電極用接続配線１２とをワイヤー３４でボンディングした、いわゆるフェイスアップ実装（もしくはＯＬＢ（Outer Lead Bonding）実装）と呼ばれる実装形態により駆動用ＩＣを実装してもよい。

【００８６】また図７に示すように、上側基板３の内面には多数の走査電極７が形成されている。そして、下側基板２、上側基板３双方の液晶層２８に接する最上層には配向膜３５，３６がそれぞれ形成されている。配向膜３５，３６はポリイミド等の膜からなり、ラビング等の配向処理が施されたものである。また、下側基板２と上側基板３の間には基板間の間隔（以下、セルギャップという）を一定に保持するためのスペーサ３７が散布されている。

【００８７】一方、図８は図６のＢ－Ｂ’線に沿う断面図、すなわち走査電極７に沿った方向に切断した断面図であり、走査電極用引き廻し配線１３の構成が示されている。この図に示すように、上側基板３の内面上に、シール材２７の上面と走査電極７の端部で接触するように走査電極７が形成されている。また、下側基板２の内面上には、多数の信号電極６が形成されるとともに、シール材２７の下面と接触するように走査電極用接続配線２１が形成されている。ここで、シール材２７の内部には樹脂等のバインダー中に金属粒子、プラスチックボールの表面を金属めっきした粒子等の導電材が混入されており、シール材２７の上面および下面にそれぞれ接触した走査電極７と走査電極用接続配線２１とが異方性を有して電気的に接続されて上下導通部（基板間接続部、第２の引き廻し導電部の第２の部分）１９を構成している。

【００８８】以下、下側基板２の内面から外面にわたって電気的に接続される構成は、信号電極用引き廻し配線１１の場合と同様である。すなわち、下側基板２の外面上に走査電極用接続配線１４が形成され、内面側、外面側双方の走査電極用接続配線２１，１４の先端のランド２３，２５の部分にスルーホール３８が形成されてい

る。スルーホール３８の内部には銀ペースト等の導電性材料が充填され、この導電性材料が孔内接続部（第２の孔内接続部、第２の引き廻し導電部の第１の部分の一部）２０を構成し、内面側、外面側の走査電極用接続配線２１，１４を互いに電気的に接続している。

【００８９】また、下側基板２の外面上の走査電極用接続配線１４の一端にはスルーホール３８が設けられ、反対側の端部には駆動用ＩＣ１０の端子３１が接続されている。以上のような配線構造を採ることにより、駆動用ＩＣ１０から出力された走査信号は、下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上の走査電極用接続配線２１、上下導通部１９を経由して各走査電極７に供給される。よって、これら下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上の走査電極用接続配線２１、および上下導通部１９が走査電極用引き廻し配線１３を構成することになる。

【００９０】なお、シール材２７の内部に導電材を混入してこの部分を上下導通部１９とすることに代えて、例えば図９に示すように、上側基板２の内面上でシール材２７外側の下側基板２のスルーホール３８の上方にあたる位置まで走査電極７を延在させ、下側基板２のスルーホール３８の上方に任意の上下導通材３９を形成し、この部分を上下導通部（基板間接続部、第２の引き廻し導電部の第２の部分）４０としてもよい。この上下導通材３９は、例えば銀ペースト等の印刷により形成することができる。この構成の場合、シール材２７の部分では電気的導通がないが、上下導通材３９の形成部分で基板間の導通がなされ、導通経路としては図８の配置、及び接続構造とほとんど同様になる。

【００９１】以下、本発明の液晶装置の製造方法を前記の構成のパッシブマトリクス型液晶表示装置の製造方法に適用した第１の実施の形態について説明する。

【００９２】下側基板２の材料としてポリイミド基板を用意し、基板の表裏両面にアルミニウム等の金属材料からなる導電性薄膜を成膜する。次に、基板両面の導電性薄膜上に感光性レジストを塗布した後、基板両面上にフォトマスクを配置し、同時に露光を行う。次いで、周知のフォトリソグラフィー、エッチング技術を用いて下側基板の表裏両面の導電性薄膜のパターニングを同時に行うことにより、上述の下側基板２内面側の信号電極（第１の導電部）６、各接続配線１８，２１、外面側の信号電極用接続配線（第１の外面上接続部）１２、走査電極用接続配線（第２の外面上接続部）１４、信号入力用配線４１、外部接続端子２６等を一括して形成する。

【００９３】次に、この基板上の各接続配線端部の所定の箇所にＣＯ２レーザー等を照射することによって基板を貫通するスルーホール１７，３８を形成する。スルーホールの他の形成方法としては、レジストパターンをマスクとしたケミカルエッチング等を用いてもよい。その後、スルーホール１７，３８の内部に銀ペースト等の導電性材料を充填して孔内接続部１５，２０を形成し、下側基板２両面の各接続配線間を電気的に導通させる。また、孔内接続部の他の形成方法としては、電解メッキ処理等を用いてスルーホールの内壁に導電性材料を付着させる方法でもよい。いずれにしても、本実施の形態の場合、基板の表裏両面の導電性薄膜材料を同じにしたことによって、１回のフォトリソグラフィー、エッチング工程で下側基板２内面側の信号電極等と外面側の各種接続配線等を同時に形成できるため、製造工程を大幅に簡略化することができる。このようにすると、内面側に信号電極６とこれに接続された信号電極用接続配線１８と、走査電極用接続配線２１が設けられ、外面側に信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１が設けられ、信号電極用接続配線１８と信号電極用接続配線１２とが孔内接続部１５を介して電気的に導通され、走査電極用接続配線２１と走査電極用接続配線１４とが孔内接続部２０を介して電気的に導通された下基板２が得られる。この後、下側基板２の外面の略全面に亘ってポリイミド、レジスト等の樹脂を塗布、硬化して第１の保護層８２を形成し、外面側の各種接続配線を保護しておくことが好ましい。

【００９４】一方、上側基板３の材料としてポリカーボネート、ポリエーテルスルホン、アクリル系樹脂等の透明基板を用意し、基板の一面（内面となる面）側にＩＴＯ等の透光性導電膜を成膜する。次いで、周知のフォトリソグラフィー、エッチング技術を用いて透光性導電膜をパターニングし、ストライプ状の走査電極７を形成する。

【００９５】次に、下側基板２、上側基板３双方の内面上にポリイミド等を塗布、焼成した後、ラビング法等による配向処理を施して配向膜３５，３６をそれぞれ形成すると、図２４（ａ）に示すような上側基板３と、図２４（ｂ）に示すような下側基板２が得られる。なお、図２４（ａ）は、走査電極７と交差する方向に沿った方向の上側基板３の断面図である。一方、図２４（ｂ）は、信号電極６に沿った方向の下基板２の断面図であるため、走査電極用接続配線１４、２１、孔内接続部２０は、隠れているため図示していない。ここで下側基板２の内面上に配向膜３５を形成するとき、下側基板３の外面に形成された信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１は、第１の保護層８２で保護されているので、傷が付いたり有機溶剤等の薬液で腐食するのを防止でき、また、導電性の塵等の付着を防止できる。

【００９６】次いで、下側基板２、上側基板３のいずれか一方の基板を定盤上に配置し、この基板上にセルギャップを保持するためのスペーサ３７を散布し、シール材２７となる樹脂材料を印刷した後、下側基板２と上側基板３を重ね合わせ、加圧して貼り合わせ、シール材２７

を硬化させて、空セルを作製する。本実施の形態の場合、シール材２７の部分を上下導通部とするためにシール材２７となる樹脂材料の中に金属粒子等の導電材を混入させておく。このようにすると、シール材２７と孔内接続部２０を介して走査電極７と走査電極用接続配線２１が電気的に接続される。

【００９７】ここで基板２、３を貼り合わせるとき、下側基板３の外面に形成された信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１は、第１の保護層８２で保護されているので、傷が付いたり、導電性の塵等が付着するのを防止できる。また、下側基板２の外面側は第１の保護層８２により平坦化されているので、基板２、３の貼り合わせ工程で熱がかかった際に基板３と配線との熱膨張率の違いにより下側基板２の外面側に凹凸が生じるのを回避でき、基板間の間隔（セルギャップ）にばらつきが生じるのを防止でき、セル厚を均一にできる。また、このように下側基板２の外面側が平坦となっているので、定盤の表面に対向させて配置した基板２、３に均等に圧力をかけやすい。

【００９８】次に、空セル内に、真空注入法等によりシール材の液晶注入口から液晶を注入し、液晶注入口を封止することで図２４（ｃ）に示すような液晶セル９０が得られる。この後、下側基板２の外面上に形成された第１の保護層８２のうち電子部品１０との接続領域上の部分と、外部接続端子２６上に形成された部分を剥離して、電子部品１０との接続領域にある第１の外面上接続部１２の端部（電子部品と接続する第１の引き廻し導電部の端子部）と第２の外面上接続部１４の端部（電子部品と接続する第２の引き廻し導電部の端子部）と、外部接続端子２６を露出する。

【００９９】また、パネル検査機と接続して液晶セル９０の特性（パネル特性）を調べるために、前記の部分以外の第１の保護層８２も部分的に剥離して（ここでの剥離部は図示略）配線等を部分的に露出させ、これら露出部にパネル検査機を接続しパネル特性の良否を評価し、合格したものだけを後工程に用いるのが好ましい。

【０１００】ついで、パネル特性が合格した液晶セル９０の上側基板３の外面側に位相差板４、偏光板５を順次貼着する。この後、下側基板２の外面側に形成された電子部品の接続領域にフェイスダウン実装、フェイスアップ実装等の形態で駆動用ＩＣ（電子部品）１０を実装する。以上の工程により、本実施の形態の液晶表示装置１が完成する。ここでは、パネル特性が良好な液晶セル９０だけに位相差板４、偏光板５を貼着し、電子部品１０を実装しているので、不良のパネルに位相差板、偏光板、電子部品を取り付けなくても済み、コストを削減できる。このようにして得られた液晶表示装置１の下側基板２に形成された信号電極接続配線１２、走査電極用配線１４、信号入力用配線４１は、駆動用ＩＣ１０との接続部を除いて第１の保護層８２で覆われているので、絶縁も兼ねることができるので、取り扱い易く、電子機器に組み込み易い。

【０１０１】本実施の形態の液晶表示装置の製造方法では、下側基板２の外面側に駆動用ＩＣ１０を実装しており、信号電極６を下側基板２の内面から基板内部を通り下側基板２の外面にわたって設けられた信号電極用引き廻し配線１１を介して駆動用ＩＣ１０に電気的に接続しており、一方、走査電極７を、上側基板３の内面から基板間をわたって下側基板２の内面へ、さらに下側基板２の内面から基板内部を通り下側基板２の外面にわたって設けられた走査電極用引き廻し配線１３を介して駆動用ＩＣ１０に電気的に接続しているので、信号電極用引き廻し配線１１、走査電極用引き廻し配線１３の双方が、下側基板２、上側基板３各々の内面から下側基板２の内部を通って下側基板２の外面側に引き廻された液晶表示装置１が得られ、また、下側基板２を液晶表示装置そのものを構成する一方の基板として機能させると同時に、駆動回路の搭載基板としても機能させることができる。

【０１０２】したがって、本実施の形態の製造方法で製造された液晶表示装置１によれば、従来の構成において下側基板内面の表示領域外側に設けていた引き廻し領域、さらにはＦＰＣや電子部品の実装領域が不要となるので、その分だけ従来に比べて大幅に額縁を狭くすることができる。また、表示領域９内を含めて下側基板２の外面側全面に多数の接続配線をレイアウトすることができ、接続配線間のピッチを余裕を持って設計することができるので、引き廻し抵抗が増大するという問題が生じることもない。また、このように引き廻し配線の低抵抗化によりクロストークの発生を改善でき、表示品位を向上できる。

【０１０３】また、表示容量の増加に伴って引き廻し配線の本数を多くしても、上述したように引き廻し導電部を下側基板２の外面側全面にレイアウトすることができるので、引き廻し領域を下側基板内面の表示領域外側に設けていた従来の液晶装置と比べて、引き廻し配線の線幅およびピッチを余裕を持って設計することができ、引き廻し配線の断線等の不良が発生し難い。

【０１０４】さらに、本実施の形態で下側基板２の材料にポリイミドを用いたように、下側基板２は必ずしも透明基板である必要はないため、液晶表示装置の基板材料として従来から一般的なガラス、石英等の透明基板の他、ポリイミド等の樹脂基板、セラミック基板等を用いることもでき、下側基板２の材料選択の自由度が向上する。例えば下側基板２にセラミック基板を用いた場合、下側基板の剛性が向上するので、基板の変形が生じにくくなり、セルギャップの均一性、ひいては表示の均一性に優れた液晶表示装置が得られる。

【０１０５】また、上下の基板ともにプラスチックフィルム基板等の可撓性を有する基板を用いても良い。この構成にすると、得られる液晶表示装置の薄型化、軽量化

が図れる、基板の割れ等の破損が生じにくくなる、基板を湾曲させることで曲面表示が可能になる、等の利点が得られ、携帯機器等の電子機器に好適な液晶表示装置を製造できる。

【0106】また、下側基板2としては、プラスチックフィルム基板を用いる場合、この基板の両面にガスバリア層を形成したものを用いることが好ましい。ここでのガスバリア層としては、SiOx等や、プラスチックフィルム基板より稠密な有機膜を用いることができる。それは、プラスチックフィルム基板は、ガラス基板に比べて稠密性に劣るため、前記のようなガスバリア層が形成されていないと、空気中の水分や酸素がプラスチック基板を通って液晶層28に進入し、液晶層28の劣化が早くなってしまう恐れがある。

【0107】また、下側基板2が可撓性を有する基板であると、この下側基板2に上述したようなレーザー加工、ケミカルエッチング等の操作を施すことにより容易にスルーホールを形成することができる。さらに、このスルーホール内への銀ペースト等の充填、電解メッキ等を施すことにより、スルーホール内に導電性材料からなる第1の孔内接続部15，30や、第2の孔内接続部20を形成することができる。一方、第1の外面上接続部12や第2の外面上接続部14は、上述したように導電膜の成膜、パターニング等の通常の配線形成技術によって容易に形成することができ、また、基板間接続部19，40は、シール材に導電材を混入する等の方法により設けることができる。

【0108】従って、前記方法により第1の孔内接続部15又は30を形成することにより、この第1の孔内接続部15又は30を介して信号電極6と第1の外面上接続部12を電気的に接続でき、前記の方法により第2の孔内接続部20を形成することにより該第2の孔内接続部20と基板間接続部19を介して走査電極7と第2の外面上接続部14を電気的に接続できるので、下側と上側基板2，3の全ての引き廻し導電部が下側基板2の内部を通ってこの基板2の外面側に引き廻すことができ、さらに、この下側基板2の外面側に駆動用IC10を実装することで、下側基板2を液晶表示装置そのものを構成する一方の基板として機能させると同時に、駆動回路の搭載基板としても機能させることができる。

【0109】また、下側基板2外面の周縁部に外部接続端子26を設けたことにより、駆動用IC10に駆動信号を供給するためのFPCなどをさらに実装するような場合、外部接続端子26とFPCの端子を接続する際の位置合わせを容易に行うことができる。また、FPC接合時もしくは接合後、接合部分に応力が発生する場合があるが、その位置が表示領域9から外れた基板周縁部であれば、前記応力が表示に悪影響を及ぼすこともない。

【0110】本実施の形態の場合、下側基板2のスルーホール17，38の位置をシール材27の外側に配置したため、スルーホール17，38の孔内接続部15，20の部分が下側基板2上で若干盛り上がった形状となったとしても、その影響でシール材27内部の表示領域9のセルギャップが変わるようなこともなく、画像表示上何ら支障がない。

【0111】また本実施の形態では、上述したように、下側基板2の内面側の信号電極6等と外面側の各種接続配線等をアルミニウムなどの同じ材料を用いて形成したため、製造工程の簡略化を図ることができたが、下側基板2の内面側の信号電極6等と外面側の各種接続配線等を異なる材料で形成してもよい。例えば、内面側の信号電極6には光反射率の高い銀（又は銀を含有する合金）、アルミニウム等の金属材料を用い、外面側の接続配線には低抵抗材料である銅等の金属材料を用いるようにしても良い。このようにすると、製造工程の簡略化という前記の利点は得られない代りに、引き廻し抵抗のより一層の低減を図ることができる。

【0112】また下側基板2の構成に関しては、基板の内外面に導電層を形成し基板を貫通するスルーホールにより、内外面の導電層の導通を図る基板だけでなく、例えば図13に示すように、下側基板2の内部に1層以上の内部導電層42を有する基板、いわゆる多層プリント配線基板のような基板を用いてもよい。この場合には、下側基板2の内面と外面の間の電気的導通は、下側基板2の内面と内部導電層42との間を貫通及び導通するビアホール43内の孔内接続部44、および下側基板2の外面と内部導電層42との間を貫通及び導通するビアホール45内の孔内接続部46（もしくは内部導電層が2層以上ある場合には相互の内部導電層間を貫通及び導通するビアホール内の孔内接続部）によってなされることになる。

【0113】下側基板2にこの種の基板を用いると、例えば引き廻し配線の数が増え、下側基板の外面上だけで多数の引き廻し配線を引き廻すことが難しくなった場合に、一部の引き廻し配線を内部導電層を経由して引き廻すこともできる。そうすれば、引き廻しの自由度が向上するので、表示容量の増大にも対応することが可能になる。

【0114】［第2の実施の形態］以下、本発明の液晶装置の製造方法の第2の実施の形態で得られた液晶装置を図14～図16を参照して説明する。

【0115】本実施の形態も第1の実施の形態と同様、本発明の液晶装置の製造方法をパッシブマトリクス型液晶表示装置の製造方法に適用した例であって、光反射部を兼ねた表示電極、いわゆる反射電極を有する液晶表示装置の製造例である。

【0116】第1の実施の形態で得られた液晶表示装置と異なる点は、上側基板と下側基板がほぼ同一形状であり下側基板上のスルーホールの位置、及び外部接続端子の位置が異なっている。第1の実施の形態では、下側基

板を上側基板の外形より大きくしてスルーホールをシール材の外側に配置するとともに、外部接続端子は下側基板の外面上で上側基板から下側基板が張り出した領域の基板辺に沿って配置されたのに対し、本実施の形態では、上側基板と下側基板をほぼ等しい大きさにしてスルーホールをシール材の直下に配置している。即ち、シール材の形成領域にスルーホールを配置している。また、更に、外部接続端子の配置は、下側基板の外面上で上下両基板の重なる領域に配置されている。

【０１１７】このように、本実施の形態で得られた液晶表示装置の概略構成は第１の実施の形態で得られた液晶表示装置と共通であるため、共通な構成については図示および説明を省略する。図１４は第１の実施の形態で示した図６に対応する図であって、上側基板と下側基板を重ね合わせた状態を示す透視図、図１５は図１４のＡ－Ａ’線に沿う断面図、図１６は図１４のＢ－Ｂ’線に沿う断面図である。なお、これらの図面において、図１～図１３と共通の構成要素については同一の符号を付す。

【０１１８】本実施の形態で得られた液晶表示装置５０は、図１４に示すように、下側基板２の内面上に多数の信号電極６（第１の導電部）がストライプ状に設けられており、各信号電極６の長さ方向（配線形成方向）の一端には、先端のランド１６の中央にスルーホールを有する信号電極用接続配線１８が設けられている。これと対向する上側基板３の内面上には、信号電極６と直交する方向に多数の走査電極７（第２の導電部）がストライプ状に設けられている。そして、図１５、図１６に示すように、下側基板２の外面上には、信号電極用引き廻し配線１１（第１の引き廻し導電部）の一部を構成する信号電極用接続配線１２（第１の外面上接続部）、および走査電極用引き廻し配線１３（第２の引き廻し導電部）の一部を構成する走査電極用接続配線１４（第２の外面上接続部）がそれぞれ配設されており、駆動用ＩＣ１０と電気的に接続されている。さらに、下側基板２の外面上には、外部接続端子２６、信号入力用配線４１等が設けられている。以上の構成は、第１の実施の形態で得られた液晶表示装置と同様である。

【０１１９】また第１の実施の形態で製造した液晶表示装置の場合、スルーホール３８の位置がシール材２７（上下導通部）の位置の外側に離れて配置されていたので、下側基板２のシール材の外側の内面上に、シール材２７とスルーホール３８内の孔内接続部２０との間を電気的に接続する走査電極用接続配線２１が形成されていた。これに対して、本実施の形態で製造した液晶表示装置の場合、スルーホール３８とシール材２７とが同じ位置にあるので、第１の実施の形態における下側基板２内面上の走査電極用接続配線２１に相当するものは特に必要ない。従って、下側基板２の内面上のシール材２７が配置される領域には、これに対向する位置に配置される上側基板３上の各走査電極７の本数に対応する数の矩形のランド２２が設けられている。これらランド２２の中央には下側基板２の内面、外面間を貫通するスルーホール３８が形成されている。

【０１２０】すなわち、図６と図１４を改めて比較すると、第１の実施の形態で製造した液晶表示装置では、図６に示すように、下側基板２の内面上の各信号電極用接続配線１８のランド１６の部分がシール材２７の外側（上側基板３の外側）にはみ出して位置し、各走査電極用接続配線２１の端部のスルーホール３８が設けられた円形のランド２３の部分がシール材２７の外側（上側基板３の外側）にはみ出して位置している。これに対して、本実施の形態で製造した液晶表示装置においては、図１４に示すように、下側基板２の内面上の各信号電極用接続配線１８のランド１６の部分がシール材２７の直下に位置し、各走査電極７に対応して設けられた上下導通用の矩形のランド２２の部分もシール材２７の直下に位置している。つまり、上下基板間の導通を図るランド２２、並びに下側基板２の内面上から外面上への導通を図るランド１６，２３とスルーホール１７，３８の全てをシール材２７の形成領域内に配置されている。

【０１２１】この構成を断面構造で見ると、図１５、図１６に示す通りである。すなわち、信号電極６に沿った方向に切断すると、図１５に示すように、下側基板２の内面上の信号電極６および信号電極６と一体の信号電極用接続配線１８が形成されるとともに、下側基板２の外面上には信号電極用接続配線１２が形成されている。そして、シール材２７の直下にあたる双方の信号電極用接続配線１８，１２のランド１６，２４の部分には基板を貫通するスルーホール１７が形成されている。スルーホール１７の内部には銀ペースト等の導電性材料が充填され、この導電性材料が内面側の信号電極用接続配線１８と外面側の信号電極用接続配線１２を接続することで孔内接続部１５を構成している。また、下側基板２の外面上の信号電極用接続配線１２のスルーホール１７が設けられた側と反対側の端部には、駆動用ＩＣ１０の端子３１が接続されている。孔内接続部の具体的な構成として、図１１（ａ）、（ｂ）、図１２に示したような種々の構造が採用できることは、第１の実施の形態で製造した液晶表示装置と同様である。

【０１２２】以上のような配線構造を採ることにより、駆動用ＩＣ１０からの画像信号は、下側基板２の外面上の信号電極用接続配線１２、孔内接続部１５、下側基板２の内面上の信号電極用接続配線１８を経由して各信号電極６に供給される。よって、これら下側基板２の外面上の信号電極用接続配線１２、孔内接続部１５、下側基板２の内面上の信号電極用接続配線１８が信号電極用引き廻し配線（第１の引き廻し導電部）１１を構成することになる。

【０１２３】一方、走査電極７に沿った方向に切断すると、図１６に示すように、上側基板３の内面上に、シー

ル材２７の上面と接触するように走査電極７が形成されている。また、下側基板２の内面上には、多数の信号電極６とともに、シール材２７の下面と接触するように走査電極７との接続用のランド２２が形成されている。シール材２７の内部には金属粒子等の導電材が混入されており、シール材２７の上面および下面にそれぞれ接触した走査電極７とランド２２とが電気的に接続されて上下導通部１９を構成している。

【０１２４】さらに、下側基板２の内面側のランド２２、外面側の走査電極用接続配線１４の先端のランド２５の部分にスルーホール３８が形成されている。スルーホール３８の内部には銀ペースト等の導電性材料が充填され、この導電性材料が孔内接続部２０を構成し、内面側のランド２２と外面側の走査電極用接続配線１４とを電気的に接続している。また、下側基板２の外面上の走査電極用接続配線１４のスルーホール３８が設けられた側と反対側の端部には、駆動用ＩＣ１０の端子３１が接続されている。以上のような配線構造を採ることにより、駆動用ＩＣ１０から出力された走査信号は、下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上のランド２２、上下導通部１９を経由して各走査電極７に供給される。よって、これら下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上のランド２２、および上下導通部１９が走査電極用引き廻し配線１３を構成することになる。

【０１２５】第２の実施の形態の液晶表示装置の製造方法が、第１の実施の形態と異なるところは、第１の実施の形態では、下側基板２の両面に成膜した導電性薄膜のパターニングを行って下側基板２内面側の信号電極６、各接続配線１８，２１、外面側の信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１等を一括して形成し、また、下側基板２にスルーホール３８を形成する際、後工程で基板２、３を貼り合わしたときに孔内接続部２０がシール材２７（上下導通部）の位置が離れるようにするために、スルーホール３８をシール材２７より外側の位置に形成していたのに対し、この第２の実施の形態では、下側基板２にスルーホール３８を形成する際、後工程で基板２、３を貼り合わしたときに孔内接続部２０ががシール材２７（上下導通部）の直下になるように、スルーホール３８をシール材２７と同じ位置に形成し、また、このようにスルーホール３８をシール材２７の真下に配置することにより、先の工程で下側基板２の両面に成膜した導電性薄膜のパターニングを行って各電極や接続用配線を形成するとき、走査電極用接続配線２１は形成しない点である。

【０１２６】本実施の形態で製造された液晶表示装置の場合、第１の実施の形態で製造された液晶表示装置のように下側基板２の内面上の各信号電極用接続配線１８のランド１６や走査電極７と接続されるランド２２の部分がシール材２７の外側にはみ出していないので、下側基板２の外形と上側基板３の外形とを同じ程度の大きさにできる。その結果、第１の実施の形態で製造された液晶表示装置に比べてさらに狭額縁化を図ることができる。

【０１２７】［第３の実施の形態］以下、本発明の液晶装置の製造方法の第３の実施の形態で得られた液晶装置を図１７、図１８を参照して説明する。

【０１２８】本実施の形態も第１、第２の実施の形態と同様、本発明の液晶装置の製造方法をパッシブマトリクス型液晶表示装置の製造方法に適用した例であって、光反射部を兼ねた表示電極、いわゆる反射電極を有する液晶表示装置の製造例である。そして、本実施の形態で製造された液晶表示装置は下側基板にカラーフィルターを備え、反射型カラー液晶表示装置を実現した例である。

【０１２９】本実施の形態で得られた液晶表示装置の概略構成は第１、第２の実施の形態で得られた液晶表示装置と共通であるため、共通な構成については図示および説明を省略する。図１７は第１の実施の形態で示した図７（図６のＡ－Ａ’線に沿う断面図）に対応する断面図、図１８は第１の実施の形態で示した図８（図６のＢ－Ｂ’線に沿う断面図）に対応する断面図である。なお、これらの図面において、図７、図８と共通の構成要素については同一の符号を付す。

【０１３０】本実施の形態で製造された液晶表示装置５２においては、図１７および図１８に示すように、下側基板２の信号電極６を覆うように表示領域全域に絶縁膜５３が形成され、その絶縁膜５３上にカラーフィルター５４が形成されている。カラーフィルター５４は、各画素に対応して形成された赤（Ｒ）、緑（Ｇ）、青（Ｂ）の３色の色材層５５と、金属膜、ブラックレジスト等からなる格子状の遮光膜５６（ブラックマトリクス）とから構成されている。そして、カラーフィルター５４上に配向膜３５が形成されている。信号電極６、走査電極７等の電極構成、信号電極用引き廻し配線１１、走査電極用引き廻し配線１３等の配線構成に関しては、前記第１の実施の形態と全く同様である。

【０１３１】本実施の形態の液晶表示装置の製造方法が、第１の実施の形態と異なるところは、第１の実施の形態では、下側基板２の信号電極６上に信号電極６を覆うように配向膜３５を形成していたのに対し、この第３の実施の形態では、下側基板２の信号電極６上に信号電極６を覆うように表示領域全域に絶縁膜５３を形成し、その絶縁膜５３上にカラーフィルター５４を形成し、さらに、このカラーフィルター５４上に配向膜３５を形成する点である。

【０１３２】本実施の形態の製造方法で得られた液晶表示装置においては、下側基板２の内面上にカラーフィルター５４を備えているので、狭額縁による小型化が図れ、表示品質の高いカラー液晶表示装置を実現することができ、今後、カラー化がさらに進むことが予想される

携帯電子機器等に好適なものとなる。また、本実施例においては、カラーフィルタを下側基板側に形成しているが、上側基板側に形成してもよく、その効果には何ら支障をきたすものではない。

【0133】［第4の実施の形態］以下、本発明の液晶装置の製造方法の第4の実施の形態で得られた液晶装置を図19、図20を参照して説明する。

【0134】本実施の形態も第1～第3の実施の形態と同様、本発明の液晶装置の製造方法をパッシブマトリクス型液晶表示装置の製造方法に適用した例である。しかしながら、第1～第3の実施の形態では反射電極を有するタイプの反射型液晶表示装置の製造例であったのに対して、本実施の形態の液晶表示装置の製造方法は反射層と表示電極とを別個に有するタイプの反射型液晶表示装置の製造例である。

【0135】本実施の形態で得られた液晶表示装置の全体構成は、第1、第2の実施の形態と共通であるため、共通な構成については図示および説明を省略する。図19は第1の実施の形態で示した図7（図6のA－A'線に沿う断面図）に対応する断面図、図20は第1の実施の形態で示した図8（図6のB－B'線に沿う断面図）に対応する断面図である。なお、これらの図面において、図7、図8と共通の構成要素については同一の符号を付す。

【0136】本実施の形態で製造された液晶表示装置58においては、図19および図20に示すように、下側基板2上の表示領域全域にアルミニウム、銀（又は銀を含有する合金）等の光反射率の高い金属薄膜からなる反射層59が形成されている。そして、この反射層59を覆うように絶縁膜60が形成され、その絶縁膜60上に多数の信号電極6がストライプ状に形成されている。信号電極6は、絶縁膜60および反射層59の形成領域外では下側基板2上に直接形成された状態となっているため、スルーホール17，38の部分の接続構造は第1の実施の形態と全く同様である。また、図21に示すように、信号電極用接続配線18を反射層59を形成する際に同時に形成し、少なくとも表示領域内の反射層59表面に絶縁膜59が形成し、絶縁膜60上に多数の信号電極6がストライプ状に形成されている。信号電極6は延伸され信号電極用接続配線18と電気的に導通させる構成としてもよい。　本実施の形態で製造された液晶表示装置58の場合、信号電極6は光反射層を兼ねておらず、信号電極6の下方に反射層59が別個に形成されている。したがって、表示時には上側基板3の外方から入射し、液晶層28を透過した光が反射層59の表面で反射し、画像表示がなされるようになっているので、反射層59の上方に位置する信号電極6は透明でなければならない。したがって、本実施の形態では、信号電極6は上側基板3の走査電極7と同様、ITO等の透光性導電膜で形成されている。また第1の実施の形態で製造した液晶表示装置と同様、図20に示すように、下側基板2の内面上には、シール材27の部分の上下導通部19とスルーホール38の部分の孔内接続部20とを電気的に接続する走査電極用接続配線21が設けられているが、この走査電極用接続配線21は、反射層59と同じ材料であるアルミニウム、銀（又は銀を含有する合金）等の金属膜で形成してもよいし、信号電極6と同じ材料であるITO等の透光性導電膜で形成してもよい。いずれにしろ、反射層59または信号電極6と同じ材料を用いる限り、製造工程が増えることはない。

【0137】一方、下側基板2の外面側には、信号電極用接続配線12、走査電極用接続配線14、信号入力用配線等が設けられており、これら配線の引き廻しについては第1の実施の形態と同様であるが、配線の材料としては銅等の低抵抗金属材料が用いられている。

【0138】本実施の形態の液晶表示装置の製造方法が、第1の実施の形態と異なるところは、第1の実施の形態では、下側基板2の内面にアルミニウム等の金属材料からなる導電性薄膜をパターニングして信号電極6を形成していたのに対し、この第4の実施の形態では、下側基板2上の表示領域全域にアルミニウム、銀等の光反射率の高い金属薄膜を形成して反射層59を形成し、この反射層59を覆うように絶縁膜60が形成され、反射層59および絶縁膜60の形成領域外の基板2上と絶縁膜60上に形成したITO等の透光性導電膜をパターニングして多数の信号電極6をストライプ状に形成する点である。

【0139】本実施の形態の液晶表示装置の製造方法においても、下側基板2にスルーホール17，38を設け、信号電極6、走査電極7それぞれの引き廻し配線11，13を下側基板2の外面側に引き廻し、駆動用IC10を実装したことにより狭額縁化を図ることができる、という第1～第3の実施の形態と同様の効果を得ることができる。

【0140】本実施の形態の液晶表示装置の製造方法の場合、反射層59と信号電極6とを別個に設けるため、液晶表示装置に備えられる反射層として必要な特性と信号電極として必要な特性を分けて考えることができ、特に信号電極の設計の自由度を上げることができる。しかも本実施の液晶表示装置の製造方法の場合、下側基板2外面の各種接続配線等には銅等の低抵抗金属材料を用いるため、内面側の導電層材料と異なることで製造プロセスが若干複雑にはなるものの、引き廻し抵抗をが低減でき、液晶表示装置の表示品質の向上を図ることができる。

【0141】［第5の実施の形態］以下、本発明の液晶装置の製造方法の第5の実施の形態で得られた液晶表示装置を図22を参照して説明する。

【0142】前記第1～第4の実施の形態ではパッシブマトリクス型液晶表示装置の製造例を示したが、本実施

の形態では、ＴＦＤをスイッチング素子に用いたアクティブマトリクス方式の反射型液晶表示装置の製造方法への本発明の適用例を示す。図２２（ａ）は本実施の形態で得られた液晶表示装置の全体構成を示す斜視図であり、図２２（ｂ）は図２２（ａ）における一画素の拡大図である。

【０１４３】本実施の形態で得られた液晶表示装置６１は、図２２（ａ）に示すように、２枚の基板、すなわちＴＦＤ素子が形成された側の素子基板６２（第１の基板）と対向基板６３（第２の基板）とが対向配置され、これら基板間に液晶（図示略）が封入されている。なお、図示は省略するが、実際には液晶と接する各基板の内面には配向膜が形成されている。素子基板６２の内面側には、多数のデータ線６４（第１の導電部）が設けられており、各データ線６４に対して多数の画素電極６５がＴＦＤ素子６６を介して接続されている。一方、対向基板６３の内面側には、短冊状の多数の走査線６７（第２の導電部）がデータ線に交差する方向に形成されている。

【０１４４】また、素子基板６２の外面には、データ線用接続配線および走査線用接続配線（いずれも図示略）が設けられ、データ線６４、走査線６７をそれぞれ駆動するデータ線駆動回路、走査線駆動回路（いずれも図示略）がそれぞれ形成されている。また、この素子基板６２の外面には、前記データ線駆動回路と走査線駆動回路が形成された領域を除く領域に第１の保護層（図示略）が形成されており、この第１の保護層により、前記データ線用接続配線と前記走査線用接続配線が覆われている。

【０１４５】ＴＦＤ素子６６は、図２２（ｂ）に示すように、例えばタンタル膜からなる第１の導電膜６８と、第１の導電膜６８の表面に陽極酸化によって形成されたタンタル酸化膜からなる絶縁膜６９と、絶縁膜６９の表面に形成されたクロム、アルミニウム、チタン、モリブデン等の金属膜からなる第２の導電膜７０とから構成されている。そして、ＴＦＤ素子６６の第１の導電膜６８がデータ線６４に接続され、第２の導電膜７０が画素電極６５に接続されている。本実施の形態で得られた液晶表示装置の場合、画素電極６５が光反射層を兼ねる反射電極であり、アルミニウム等の光反射率の高い金属薄膜から形成されている。もしくは、第４の実施の形態のように、画素電極６５をＩＴＯ等の透光性導電膜で形成し、画素電極６５の下方に反射層を別個に形成してもよい。一方、対向基板６３の内面の走査線６７は、ＩＴＯ等の透光性導電膜で形成されている。

【０１４６】そして、本実施の形態で得られた液晶表示装置６１の場合、素子基板６２の内面の各データ線６４の一端が矩形状に形成され、この部分に素子基板６２の内面側と外面側を貫通するスルーホール７１が形成されている。断面構造は、第１の実施の形態で示した図７および図８において、信号電極６を本実施の形態のデータ線６４に置き換えたものと同様になる。

【０１４７】すなわち、素子基板６２の内面上にデータ線６４が形成される一方、素子基板６２の外面上にはデータ線用接続配線が形成され、双方の配線の先端には基板を貫通するスルーホール７１が形成されている。スルーホール７１の内部には銀ペースト等の導電性材料が充填されており、この導電性材料が内面側のデータ線と外面側のデータ線用接続配線を接続することで孔内接続部を構成する。そして、データ線用接続配線の他端には駆動用ＩＣが接続されている。以上のような配線構造を採ることにより、駆動用ＩＣから出力された画像信号は、素子基板６２の外面上のデータ線用接続配線、孔内接続部を経由して各データ線６４に供給される。つまり、これら素子基板６２の外面上のデータ線用接続配線、孔内接続部がデータ線用引き廻し配線を構成することになる。

【０１４８】一方、対向基板６３の走査線６７側については、シール材の上面と接触するように走査線６７が形成されている。シール材中には金属粒子等の導電材が混入されており、シール材の上面および下面が電気的に接続されて上下導通部を構成する。素子基板６２の上下導通部の下部にあたる部分はランドおよびスルーホールが形成されており、スルーホールの内部に銀ペースト等の導電性材料が充填され、この導電性材料が孔内接続部を構成し、この孔内接続部と上下導通部を介して対向基板６３の内面側の走査線６７と素子基板６２の外面側の走査線用接続配線を電気的に接続している。また、素子基板の外面上の走査線用接続配線の他端には駆動用ＩＣが接続されている。以上のような配線構造を採ることにより、駆動用ＩＣから出力された走査信号は、素子基板６２の外面上の走査線用接続配線、孔内接続部、上下導通部を経由して対向基板６３上の各走査線６７に供給される。つまり、これら素子基板６２の外面上の走査線用接続配線、孔内接続部、および上下導通部が走査線用引き廻し配線を構成することになる。

【０１４９】以下、本実施の形態の液晶表示装置の製造方法について説明する。

【０１５０】まず、素子基板６２の材料としてポリイミド基板を用し、この基板の一面（内面となる面）上にデータ線６４とＴＦＤ素子６６と画素電極６５を形成し、一方、他方の面（外面となる面）にデータ線用接続配線と走査線用接続配線を形成する。

【０１５１】次に、この基板上のデータ線６４の端部の所定の箇所にデータ線用のスルーホール７１を形成し、さらにこの基板には、後工程で基板６２、６３をシール材を介して貼り合わしたときに、シール材の真下に位置する走査線用のスルーホールを形成する。その後、データ線用のスルーホール７１の内部に銀ペースト等の導電性材料を充填して孔内接続部を形成し、基板両面の各デ

ータ線６４とデータ線用接続配線間を電気的に導通させ、一方、走査用のスルーホールの内部に銀ペースト等の導電性材料を充填して孔内接続部を形成し、この孔内接続部と基板６２外面の走査線用接続配線間を電気的に導通させる。

【０１５２】この後、素子基板６２の外面に略全面に亘ってポリイミド、レジスト等の樹脂を塗布、硬化して第１の保護層を形成し、外面側のデータ線用接続配線と走査線用接続配線を保護する。

【０１５３】一方、対向基板６３の材料としてポリカーボネート等の透明基板を用意し、基板の一面（内面となる面）側に走査線６７を形成する。ここで走査線６７を形成する際、後工程で基板６２、６３をシール材を介して貼り合わしたときにシール材の上面と走査線６７の端部が接触するように形成する。

【０１５４】次に、両基板の双方の内面上に配向膜をそれぞれ形成すると、素子基板６２と対向基板６３が得られる。

【０１５５】次いで、素子基板６２、対向基板６３のいずれか一方の基板を定盤上に配置し、この基板上にスペーサを散布し、シール材となる樹脂材料を印刷した後、素子基板２と対向基板３を重ね合わせ、加圧して貼り合わせ、前記シール材を硬化させて、空セルを作製する。本実施の形態の場合、シール材の部分を上下導通部とするためにシール材となる樹脂材料の中に金属粒子等の導電材を混入させておく。このようにすると、シール材と孔内接続部を介して走査線６７と走査電極用接続配線が電気的に接続される。

【０１５６】次に、空セル内に、シール材の液晶注入口から液晶を注入し、液晶注入口を封止することで液晶セルが得られる。この後、データ線用接続配線、走査線用接続配線上に形成された第１の保護層のうち駆動用ＩＣとの接続領域上の部分を剥離して、駆動用ＩＣとの接続領域にあるデータ線用接続配線の端部（電子部品と接続する第１の引き廻し導電部の端子部）と走査線用接続配線の端部（電子部品と接続する第２の引き廻し導電部の端子部）を露出する。

【０１５７】ついで、前記液晶セルの対向基板６３の外面側に位相差板（図示略）、偏光板（図示略）を順次貼着する。この後、素子基板６２の外面側に形成された駆動用ＩＣの接続領域にフェイスダウン実装、フェイスアップ実装等の形態で駆動用ＩＣを実装する。以上の工程により、液晶表示装置６１が完成する。

【０１５８】本実施の形態はＴＦＤ素子を用いたアクティブマトリクス型液晶表示装置の製造例であるが、この場合も前記第１～第４の実施の形態のパッシブマトリクス型液晶表示装置の製造例と同様の効果を得ることができる。すなわち、本実施の形態の製造方法で得られた液晶表示装置は、素子基板６２の内面の表示領域外部に引き廻し配線を配置するスペースが要らなくなり、しかもＴＦＤアクティブマトリクス型液晶表示装置に必要なデータ線駆動回路、走査線駆動回路等の形成領域を素子基板６２の外面側に配置できるので、大幅な狭額縁化を図ることができる。また、素子基板６２の外面側全域を引き廻し配線のためのスペースとできるので、充分な配線ピッチを確保することができ、引き廻し抵抗の増大を招くこともない。

【０１５９】［第６の実施の形態］以下、本発明の液晶装置の製造方法の第６の実施の形態で得られた液晶装置を図２３を参照して説明する。

【０１６０】本実施の形態では、ＴＦＴをスイッチング素子に用いたアクティブマトリクス方式の反射型液晶表示装置の製造方法への本発明の適用例を示す。図２３（ａ）は本実施の形態で得られた液晶表示装置の全体構成を示す斜視図であり、図２３（ｂ）は図２３（ａ）における一画素の拡大図である。

【０１６１】本実施の形態で得られた液晶表示装置７３は、図２３（ａ）に示すように、第５の実施の形態の製造方法で得られたＴＦＤ型液晶表示装置とほぼ同様の構成を有している。すなわち、ＴＦＴ素子が形成された側の素子基板７４（第１の基板）と対向基板７５（第２の基板）とが対向配置され、これら基板間に液晶（図示略）が封入されている。素子基板７４の内面側には、多数のソース線７６（データ線、第１の導電部）および多数のゲート線７７（走査線、第１の導電部）が互いに交差するように格子状に設けられている。各ソース線７６と各ゲート線７７の交差点の近傍にはＴＦＴ素子７８が形成されており、各ＴＦＴ素子７８を介して画素電極７９が接続されている。一方、対向基板７５の内面側全面には、表示領域に対応して共通電極８０（第２の導電部）が形成されている。

【０１６２】また、素子基板７４の外面にはソース線用接続配線およびゲート線用接続配線（いずれも図示略）が設けられ、ソース線７６、ゲート線７７をそれぞれ駆動するソース線駆動回路、ゲート線駆動回路（いずれも図示略）がそれぞれ形成されている。

【０１６３】ＴＦＴ素子７８は、図２３（ｂ）に示すように、ゲート線７７から延びるゲート電極８１と、ゲート電極８１を覆う絶縁膜（図示略）と、絶縁膜上に形成された多結晶シリコン、アモルファスシリコン等からなる半導体層８２と、半導体層８２中のソース領域に接続されたソース線７６から延びるソース電極８３と、半導体層８２中のドレイン領域に接続されたドレイン電極８４とを有している。そして、ＴＦＴ素子７８のドレイン電極８４が画素電極７９に接続されている。本実施の形態で得られた液晶表示装置の場合も第５の実施の形態で得られた液晶表示装置と同様、画素電極７９が光反射層を兼ねる反射電極であり、アルミニウム等の光反射率の高い金属薄膜から形成されている。もしくは、第４の実施の形態のように、画素電極７９をＩＴＯ等の透光性導

電膜で形成し、画素電極７９の下方に反射層を別個に形成してもよい。一方、対向基板７５側の共通電極８０は、ＩＴＯ等の透光性導電膜で形成されている。

【０１６４】そして、本実施の形態で得られた液晶表示装置７３の場合、素子基板７４の内面の各ソース線７６の一端が矩形状に形成され、この部分に素子基板７４の内面側と外面側を貫通するスルーホール８５が形成されている。同様に、各ゲート線７７の一端も矩形状に形成され、この部分に素子基板７４の内面側と外面側を貫通するスルーホール８６が形成されている。スルーホール８５，８６の部分の断面構造は、第１の実施の形態で示した図７および図８において、信号電極６を本実施の形態のソース線７６もしくはゲート線７７に置き換えたものと同様になる。

【０１６５】すなわち、素子基板７４の内面上にソース線７６が形成される一方、素子基板７４の外面上にはソース線用接続配線が形成され、双方の配線の先端には基板を貫通するスルーホール８５が形成されている。スルーホール８５の内部には銀ペースト等の導電性材料が充填されており、この導電性材料が内面側のソース線７６と外面側のソース線用接続配線を接続することで孔内接続部を構成する。そして、ソース線用接続配線の他端には駆動用ＩＣが接続されている。以上のような配線構造を採ることにより、駆動用ＩＣから出力された画像信号は、素子基板７４の外面上のソース線用接続配線、孔内接続部を経由して各ソース線７６に供給される。よって、これら素子基板７４の外面上のソース線用接続配線、孔内接続部がソース線用引き廻し配線を構成することになる。

【０１６６】ゲート線側も同様の配線構造を採っており、駆動用ＩＣから出力された走査信号は、素子基板７４の外面上のゲート線用接続配線、孔内接続部を経由して各ゲート線７７に供給される。よって、これら素子基板７４の外面上のゲート線用接続配線、孔内接続部がゲート線用引き廻し配線を構成することになる。

【０１６７】一方、対向基板７５の共通電極８０については、共通電極８０の一部がシール材の上面と接触するように形成されている。シール材中には金属粒子等の導電材が混入されており、シール材の上面および下面が電気的に接続されて上下導通部を構成する。素子基板７４の上下導通部の下部にあたる部分はランドおよびスルーホールが形成されており、スルーホールの内部に銀ペースト等の導電性材料が充填され、この導電性材料が孔内接続部を構成し、この孔内接続部と上下導通部を介して対向基板７５の内面側の共通電極８０と素子基板７４の外面側の共通電極用接続配線を電気的に接続している。共通電極用接続配線は素子基板７４の外面側の任意の箇所で接地されている。

【０１６８】以下、本実施の形態の液晶表示装置の製造方法について説明する。

【０１６９】まず、素子基板７４の材料としてポリイミド基板を用し、この基板の一面（内面となる面）上にソース線７６とゲート線７７とＴＦＴ素子７８と画素電極７９を形成し、一方、他方の面（外面となる面）にソース線用接続配線とゲート線用接続配線、共通電極用接続配線を形成する。

【０１７０】次に、この基板上のソース線７６の端部の所定の箇所にスルーホール８５を形成するとともにゲート線７７の端部の所定の箇所にスルーホール８６を形成し、さらにこの基板には、後工程で基板７４、７５をシール材を介して貼り合わしたときに、シール材の真下に位置する共通電極用のスルーホールを形成する。その後、スルーホール８５の内部に銀ペースト等の導電性材料を充填して孔内接続部を形成し、基板両面の各ソース線７６とソース線用接続配線間を電気的に導通させるとともに、スルーホール８６の内部に銀ペースト等の導電性材料を充填して孔内接続部を形成し、基板両面の各ゲート線７７とゲート線用接続配線間を電気的に導通させ、一方、共通電極用のスルーホールの内部に銀ペースト等の導電性材料を充填して孔内接続部を形成し、この孔内接続部と基板７４外面の共通電極用接続配線間を電気的に導通させる。

【０１７１】この後、素子基板７４の外面に略全面に亘ってポリイミド、レジスト等の樹脂を塗布、硬化して第１の保護層を形成し、外面側のソース線用接続配線とゲート線用接続配線と共通電極用接続配線を保護する。

【０１７２】一方、対向基板７５の材料としてポリカーボネート等の透明基板を用意し、基板の一面（内面となる面）側に共通電極８０を形成する。ここで共通電極８０を形成する際、後工程で基板７４、７５をシール材を介して貼り合わしたときにシール材の上面と共通電極８０の一部が接触するように形成する。

【０１７３】次に、両基板の双方の内面上に配向膜をそれぞれ形成すると、素子基板７４と対向基板７５が得られる。

【０１７４】次いで、素子基板７４、対向基板７５のいずれか一方の基板を定盤上に配置し、この基板上にスペーサを散布し、シール材となる樹脂材料を印刷した後、素子基板７４と対向基板７５を重ね合わせ、加圧して貼り合わせ、前記シール材を硬化させて、空セルを作製する。本実施の形態の場合、シール材の部分を上下導通部とするためにシール材となる樹脂材料の中に金属粒子等の導電材を混入させておく。このようにすると、シール材と孔内接続部を介して共通電極８０と共通電極用接続配線が電気的に接続される。

【０１７５】次に、空セル内に、シール材の液晶注入口から液晶を注入し、液晶注入口を封止することで液晶セルが得られる。この後、ソース線用接続配線とゲート線用接続配線と共通電極用接続配線上に形成された第１の保護層のうち駆動用ＩＣとの接続領域上の部分を剥離し

て、駆動用ＩＣとの接続領域にあるソース線用接続配線の端部（電子部品と接続する第１の引き廻し導電部の端子部）とゲート線用接続配線の端部（電子部品と接続する第２の引き廻し導電部の端子部）を露出する。

【０１７６】ついで、前記液晶セルの対向基板７５の外面側に位相差板（図示略）、偏光板（図示略）を順次貼着する。この後、素子基板７４の外面側に形成された駆動用ＩＣの接続領域にフェイスダウン実装、フェイスアップ実装等の形態で駆動用ＩＣを実装する。以上の工程により、液晶表示装置７３が完成する。

【０１７７】本実施の形態はＴＦＴ素子を用いたアクティブマトリクス型液晶表示装置の製造例であるが、この場合も前記第５の実施の形態のアクティブマトリクス型液晶表示装置の製造例と同様の効果を得ることができる。すなわち、本実施の形態の製造方法で得られた液晶表示装置は、素子基板７４の内面の表示領域外部に引き廻し配線を配置するスペースが要らなくなり、しかもＴＦＴアクティブマトリクス型液晶表示装置に必要なソース線駆動回路、ゲート線駆動回路等の駆動回路形成領域を素子基板７４の外面側に配置できるので、大幅な狭額縁化を図ることができる。また、素子基板７４の外面側全域を引き廻し配線のためのスペースとできるので、充分な配線ピッチを確保することができ、引き廻し抵抗の増大を招くこともない。

【０１７８】［第７の実施の形態］以下、本発明の液晶装置の製造方法の第７の実施の形態で得られた液晶装置を図２５を参照して説明する。

【０１７９】本実施の形態も第１乃至第２の実施の形態と同様、本発明の液晶装置の製造方法をパッシブマトリクス型液晶表示装置の製造方法に適用した例であって、光反射部を兼ねた表示電極、いわゆる反射電極を有する液晶表示装置の製造例である。

【０１８０】本実施の形態で得られた液晶表示装置の概略構成は第１、第２の実施の形態で得られた液晶表示装置と共通であるため、共通な構成については図示および説明を省略する。図２５は第１の実施の形態で示した図７（図６のＡ－Ａ’線に沿う断面図）や図１０（図６のＡ－Ａ’線に沿う断面図）に対応する断面図である。なお、図２５において、図７と図１０と共通の構成要素については同一の符号を付す。

【０１８１】この第７の実施の形態で得られた液晶表示装置８５が、第１乃至第２の実施の形態で得られた液晶表示装置と異なる点は、下側基板の材料としてガラス基板やガラス強化プラスチック基板が用いられ、下側基板２に予め形成された凹部２ａに駆動用ＩＣ１０を埋め込み、駆動用ＩＣ１０の表面側に設けられた電極パッド３３と信号電極用接続配線１２と、電極パッド３３と走査電極用接続配線をワイヤー３４でボンディングした、いわゆるフェイスアップ実装（もしくはＯＬＢ（Outer Lead Bonding）実装）と呼ばれる実装形態により駆動用ＩＣ１０が実装され、さらに、これら駆動用ＩＣ１０と、この駆動用ＩＣ１０と各接続配線との接続部と、第１の保護層８２が第２の保護層８４で覆われた点である。

【０１８２】本実施の形態の液晶表示装置の製造方法が、第１の実施の形態と異なるところは、下側基板の材料としてガラス基板やガラス強化プラスチック基板を用い、この下側基板には駆動用ＩＣの実装前に予め凹部２ａを形成しておくことと、駆動用ＩＣ１０の実装工程では、下側基板２に予め形成された凹部２ａに駆動用ＩＣ１０を埋め込み、駆動用ＩＣ１０の表面側に設けられた電極パッド３３と信号電極用接続配線１２と、電極パッド３３と走査電極用接続配線をワイヤー３４でボンディングすることにより駆動用ＩＣ１０を実装し、さらに駆動用ＩＣ１０の実装後に、駆動用ＩＣ１０と、この駆動用ＩＣ１０と各接続配線との接続部と、第１の保護層８２上に第２の保護層８４を形成して、下側基板２の外面側を平坦化する点である。

【０１８３】本実施の形態の液晶表示装置の製造方法では、上記のような第２の保護層８４を形成する工程を行っているので、液晶表示装置８５の下側基板２の外面側の接続配線１２、１４と駆動用ＩＣ１０の接続部が第２の保護層８４で保護され、この接続部に傷が付いたり、汚染されるのを防止でき、また、この第２の保護層８４は絶縁も兼ねることができるので、この製造方法で得られた液晶表示装置８５が取り扱い易くなり、電子機器に組み込み易い。また、第２の保護層８４を下側基板２の外面側の全面に形成しているので、下側基板２の外面側が平坦化され、より取り扱い易い液晶表示装置８５が得られる。

【０１８４】また、本実施の形態の液晶表示装置の製造方法においても、狭額縁による小型化が図れるという第１乃至第２の実施の形態と同様の効果を得ることができる。

【０１８５】なお、第１～第７の実施の形態においては、駆動用ＩＣ等の電子部品を下側基板（第１の基板）の外面で表示領域内に実装する場合について説明したが、前記電子部品は第１の基板の外面の非表示領域に実装してもよく、その場合には表示領域内に実装する場合と比べて表示領域が小さくなるが、実装時の熱により表示領域に悪影響を及ぼすのを回避でき、表示ムラ等の発生の防止効果が優れる。

【０１８６】［第８の実施の形態］以下、本発明の液晶装置の製造方法の第８の実施の形態で得られた液晶装置を図２６～図３０を参照して説明する。

【０１８７】本実施の形態は、本発明の液晶装置の製造方法を第１の実施の形態と同様のパッシブマトリクス型液晶表示装置の製造方法に適用した例であって、透過型液晶表示装置の製造例である。

【０１８８】図２６は本実施の形態で得られた液晶表示装置全体を上面側から見た斜視図、図２７は下面側から

見た斜視図、図２８は下側基板を下面側から観た透過平面面、図２９は上側基板と下側基板を重ね合わせた状態を示す透過平面図、図３０は図２９のＡ－Ａ’線に沿う断面図、図３１は図２９のＢ－Ｂ’線に沿う断面図である。

【０１８９】本実施の形態で得られた液晶表示装置の第１の実施の形態で得られた液晶表示装置と共通な構成については図示および説明を省略する。なお、図２６～図３０において、第１の実施の形態で得られた液晶装置と共通の構成要素については同一の符号を付す。

【０１９０】本実施の形態で得られた液晶表示装置９１が、第１の実施の形態で得られた液晶表示装置と異なる点は、第１の実施の形態で得られた液晶表示装置１では、反射型液晶表示装置であるため、下側基板２と上側基板３のうち少なくとも上側基板３の材料として透明基板が用いられ、また、下側基板２、３に形成される信号電極６、走査電極７、信号電極用引き廻し配線１１、走査線用引き廻し配線１３のうち少なくとも上側基板３に形成される走査電極７は透光性を有する導電材料から構成され、下側基板２上に形成される第１の保護層８２は不透明であってもよく、また、信号電極６は反射層を兼ねているのに対し、この第８の実施の形態で得られた液晶表示装置９１では、透過型液晶表示装置であるため、対向配置された下側基板２（第１の基板）と上側基板３（第２の基板）の材料としてガラス等からなる透明基板が用いられており、下側基板２、３に形成される信号電極６、走査電極７、信号電極用引き廻し配線１１、走査線用引き廻し配線１３はいずれも透光性を有する導電材料から構成され、また、下側基板２上に形成される第１の保護層８２は透光性を有しており、また、信号電極６は反射層を兼ねていない。

【０１９１】また、第１の実施の形態で得られた液晶表示装置１では、駆動用ＩＣ１０は、下側基板２の外面上に設けられた信号入力用配線４１、信号電極用接続配線１２、走査線用接続配線１４の各端部に接続されることにより下側基板２の外面上に実装されており、下側基板２の外面側周縁部に形成された外部接続端子２６に信号入力配線４１の他端部が接続されており、また、第１の保護層８２は外部接続端子２６上および駆動用ＩＣ１０の接続領域上以外の下側基板２の外面上に設けられているのに対し、本実施の形態で得られた液晶表示装置９１では、下側基板２の外面上には信号入力用配線４１は設けられておらず、下側基板２の外面上に設けられた信号電極用接続配線１２、走査線用接続配線１４の各端部に外部接続端子２６が接続され、この外部接続端子２６に駆動用ＩＣ１０等を搭載したＣＯＦ４７が接続されることにより、駆動用ＩＣ１０は下側基板１０の外方に実装されており、また、第１の保護層８２は外部接続端子２６上以外の下側基板２の外面上に設けられる点である。

【０１９２】また、第１の実施の形態で得られた液晶表示装置１では、位相差板４は偏光板５と上側基板３の間に配置されていたのに対し、本実施の形態で得られた液晶表示装置９１では、偏光板５と上側基板３の間には位相差板は配置されておらず、下側基板２の外面側にも偏光板５ａが配置され、この偏光板５ａの外方にバックライト８８（照明手段）が取り付けられている点である。

【０１９３】なお、図２７以降の図面では、偏光板５、５ａ、バックライト８８の図示を省略する。

【０１９４】また、本実施の形態の場合、全ての信号電極用接続配線１８は、図２９における信号電極６の右側の領域に引き出されているが、右側と左側に振り分けて引き出しても良いし、接続配線の引き出し方向は任意で良い。

【０１９５】また、この実施の形態で得られた液晶表示装置９１では、図２８に示すように下側基板２の外面上に、信号電極用接続配線１８のスルーホール、走査電極用接続配線２１のスルーホールの位置に対応して円形のランド２４，２５がそれぞれ設けられ、信号電極用接続配線１８のスルーホールに対応する各ランド２４から信号電極用接続配線１２がそれぞれ設けられ、走査電極用接続配線２１のスルーホールに対応する各ランド２５から走査電極用接続配線１４が設けられている。

【０１９６】下側基板２の周縁部の４辺のうち、２辺に沿って上記多数のランド２４，２５が配置されており、ランド２５が配列された辺と対向する１辺に沿って多数の外部接続端子２６が形成されている。これら外部接続端子２６の各々は信号電極用接続配線１２もしくは走査電極用接続配線１４と接続されている。

【０１９７】この透過型液晶表示装置９１では、図３０に示すように、外部接続端子２６から入力された画像信号は、下側基板２の外面上の信号電極用接続配線１２、孔内接続部１５、下側基板２の内面上の信号電極用接続配線１８を経由して各信号電極６に供給される。

【０１９８】以下、下側基板２の内面から外面にわたる走査電極用引き廻し配線１３の構成は、信号電極用引き廻し配線１１の場合と同様である。この透過型液晶表示装置９１では、外部接続端子２６から入力された走査信号は、下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上の走査電極用接続配線２１、上下導通部１９を経由して各走査電極７に供給される。

【０１９９】以下、本発明の液晶表示装置の製造方法を前記の構成の透過型液晶表示装置の製造方法に適用した実施の形態について説明する。

【０２００】下側基板２の材料としてガラス基板等の透明基板を用意し、基板の表裏両面にＩＴＯ等の透光性導電膜を成膜した後、これら両面の透光性導電膜のパターニングを同時に行うことにより、上述の下側基板２内面側の信号電極６、各接続配線１８，２１、外面側の信号電極用接続配線１２、走査電極用接続配線１４等を一括

して形成する。

【０２０１】次に、ケミカルエッチングやレーザー加工等により下側基板２上の各接続配線端部の所定の箇所に基板を貫通するスルーホール１７，３８を形成する。その後、スルーホール１７，３８の内部に導電性材料を充填する方法等により孔内接続部１５，２０を形成し、下側基板２両面の各接続配線間を電気的に導通させる。この後、下側基板２の外面の略全面に亘ってポリイミド、レジスト等の樹脂を塗布、硬化して第１の保護層８２を形成し、外面側の各種接続配線を保護しておくことが好ましい。

【０２０２】一方、上側基板３の材料としてガラス基板等の透明基板を用意し、基板の一面（内面となる面）側にＩＴＯ等の透光性導電膜を成膜後、パターニングし走査電極７を形成する。

【０２０３】次に、下側基板２、上側基板３双方の内面上に配向膜３５，３６をそれぞれ形成する。

【０２０４】次いで、これら下側基板２、上側基板３のいずれか一方の基板を定盤上に配置し、この基板上にスペーサ３７を散布し、樹脂材料中に導電材を混入させたシール材２７材料を印刷した後、下側基板２と上側基板３とを貼り合わせ、シール材２７を硬化させて、空セルを作製する。

【０２０５】次に、空セル内に、シール材の液晶注入口からＳＴＮモード等に用いられるカイラルネマチック液晶等の液晶を注入し、液晶注入口を封止することで液晶セルが作製される。

【０２０６】この後、信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１上に形成された第１の保護層８２のうち外部接続端子２６上に形成された部分を剥離して、外部接続端子２６を露出する。

【０２０７】また、パネル検査機と接続して液晶セルの特性（パネル特性）を調べるために、前記の部分以外の第１の保護層８２も部分的に剥離して配線等を部分的に露出させ、これら露出部にパネル検査機を接続しパネル特性の良否を評価し、合格したものだけを後工程に用いるのが好ましい。

【０２０８】ついで、パネル特性が合格した液晶セルの上側基板３の外面側に偏光板５ａ、下側基板２の外面側に偏光板５ａをそれぞれ貼着した後、下側基板２の外面側にバックライト８８を取り付ける。

【０２０９】この後、下側基板２の外面側周縁部に設けられた外部接続端子２６に、駆動用ＩＣ（電子部品）１０等を搭載したＣＯＦ４７を接続して、下側基板２の外方に駆動用ＩＣ（電子部品）１０を実装する。以上の工程により、本実施の形態の透過型液晶表示装置９１が完成する。

【０２１０】第８の実施の形態の液晶表示装置の製造方法では、信号電極６を下側基板２の内面から基板内部を通り下側基板２の外面にわたって設けられた信号電極用引き廻し配線１１に接続しており、一方、走査電極７を、上側基板３の内面から基板間をわたって下側基板２の内面へ、さらに下側基板２の内面から基板内部を通り下側基板２の外面にわたって設けられた走査電極用引き廻し配線１３に電気的に接続しているので、信号電極用引き廻し配線１１、走査電極用引き廻し配線１３の双方が、下側基板２、上側基板３各々の内面から下側基板２の内部を通って下側基板２の外面側に引き廻された液晶表示装置が得られる。

【０２１１】また、下側基板２外面の周縁部に引き廻し配線１１、１３と接続された外部接続端子２６を設けているので、ＣＯＦや、駆動用ＩＣが搭載されたＣＯＦなどを実装するような場合、外部接続端子２６とＣＯＦの端子を接続する際の位置合わせを容易に行うことができる。また、ＣＯＦ接合時もしくは接合後、接合部分に応力が発生する場合があるが、その位置が表示領域９から外れた基板周縁部であれば、前記応力が表示に悪影響を及ぼすこともない。

【０２１２】［第９の実施の形態］以下、本発明の液晶装置の製造方法の第９の実施の形態で得られた液晶装置を図３２、図３３を参照して説明する。

【０２１３】本実施の形態も第８の実施の形態と同様、本発明の液晶装置の製造方法をパッシブマトリクス型液晶表示装置の製造方法に適用した例であって、透過型液晶表示装置の製造例である。第８の実施の形態で得られた液晶表示装置と異なる点は、第８の実施の形態で製造した液晶表示装置９１は駆動用ＩＣの実装形態としてＣＯＦ実装を採用したのに対し、本実施の形態で製造された液晶表示装置９２ではＣＯＧ実装が採用された点である。

【０２１４】このように、本実施の形態で得られた液晶表示装置９２の概略構成は第８の実施の形態で得られた液晶表示装置９１と共通であるため、共通な構成については図示および説明を省略する。図３２は第８の実施の形態で示した図２７に対応する図であって、本実施の形態で得られた液晶表示装置全体を下面側から見た斜視図、図３３は図３２のＢ－Ｂ’線に沿う断面図である。なお、これらの図面において、図２６～図３１と共通の構成要素については同一の符号を付す。

【０２１５】第８の実施の形態で得られた液晶表示装置９１の場合、下側基板の外面上には信号電極用接続配線１２、走査電極用接続配線１４、およびこれら接続配線１２、１４と接続された外部接続端子２６が形成され、この外部接続端子２６に駆動用ＩＣ１０が搭載されたＣＯＦ４７を接続して下側基板２の外方に駆動用ＩＣ１０を実装していたが、本実施の形態で得られた液晶表示装置９２の場合、図３２に示すように、下側基板２の外面上に信号電極用接続配線１２、走査電極用接続配線１４、信号入力用配線４１、および信号入力配線４１と接続された外部接続端子２６が形成され、信号電極用接続

配線１２、走査電極用接続配線１４、および信号入力用配線４１の各端部に駆動用ＩＣ１０を接続して下側基板２の外面側に駆動用ＩＣ１０を実装している。

【０２１６】また、第８の実施の形態で得られた液晶表示装置９１では、第１の保護層８２は外部接続端子２６上以外の下側基板２の外面上に設けられているのに対し、本実施の形態で得られた液晶表示装置９２では、第１の保護層８２は外部接続端子２６上および駆動用ＩＣ１０の接続領域上および信号入力用配線４１上以外の下側基板２の外面上に設けられている点である。

【０２１７】本実施の形態で得られた液晶表示装置９２の場合、下側基板の内面上の信号電極用接続配線は、隣接する信号電極において、信号電極６の左側、右側、左側、…というように交互に反対側の領域に引き出されている。そして、信号電極用接続配線のスルーホールに対応する複数のランド２４が、下側基板２の周縁部の４辺のうち、対向する２辺に沿って設けられ、これらのランド２４から駆動用ＩＣ１０の実装領域に向けて信号電極用接続配線１２がそれぞれ設けられている。また、走査電極用接続配線のスルーホールに対応する各ランド２５が下側基板２の周縁部の１辺に沿って設けられ、これらのランド２５から駆動用ＩＣ１０の実装領域に向けて走査電極用接続配線１４が設けられている。

【０２１８】本実施の形態で得られた液晶表示装置９２は透過型液晶表示装置であるから、表示領域９内に駆動用ＩＣ１０を配置することはできず、下側基板２の１辺側が上側基板３の外側、すなわち非表示領域に延び、この部分に駆動用ＩＣ１０が実装されている。

【０２１９】図３３は、本実施の形態で得られた液晶表示装置９２を走査電極７に沿った方向に切断した断面図であり、走査電極用引き廻し配線１３の構成が示されている。この図に示すように、上側基板３の内面上に、内部に樹脂等のバインダー中に金属粒子等の導電材が混入されたシール材２７の上面と接触するように走査電極７が形成されている。また、下側基板２の内面上には、多数の信号電極６が形成されるとともに、シール材２７の下面と接触するように走査電極用接続配線２１が形成されている。

【０２２０】ここで、導電材が混入されたシール材２７の上面および下面にそれぞれ接触した走査電極７と走査電極用接続配線２１とが電気的に接続されて上下導通部１９を構成している。

【０２２１】下側基板２の外面上に走査電極用接続配線１４が形成され、内面側、外面側双方の走査電極用接続配線２１，１４の先端のランド２３，２５の部分にスルーホール３８が形成されている。スルーホール３８の内部には銀ペースト等の導電性材料が充填され、この導電性材料が孔内接続部２０を構成し、内面側、外面側の走査電極用接続配線２１，１４を互いに電気的に接続している。

【０２２２】また、下側基板２の外面上の走査電極用接続配線１４のスルーホール３８が設けられた側と反対側の端部には、駆動用ＩＣ１０の端子３２が接続されている。以上のような配線構造を採ることにより、駆動用ＩＣ１０から出力された走査信号は、下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上の走査電極用接続配線２１、上下導通部１９を経由して各走査電極７に供給される。よって、これら下側基板２の外面上の走査電極用接続配線１４、孔内接続部２０、下側基板２の内面上の走査電極用接続配線２１、および上下導通部１９が走査電極用引き廻し配線１３を構成することになる。

【０２２３】図示しない信号電極用引き廻し配線の構成も同様であって、駆動用ＩＣ１０から出力された画像信号は、下側基板２の外面上の信号電極用接続配線１２、孔内接続部、下側基板２の内面上の信号電極用接続配線を経由して各信号電極６に供給される。よって、これら下側基板２の外面上の信号電極用接続配線１２、孔内接続部、下側基板２の内面上の信号電極用接続配線が信号電極用引き廻し配線を構成することになる。

【０２２４】第９の実施の形態の液晶表示装置の製造方法が、第８の実施の形態と異なるところは、第８の実施の形態では、下側基板２内面側の信号電極６、各接続配線１８，２１、外面側の信号電極用接続配線１２、走査電極用接続配線１４、これら接続配線１２，１４と接続された外部接続端子２６を一括して形成し、また、下側基板２に形成された第１の保護層８２を部分的に剥離する際、外部接続端子２６上に形成された部分を剥離していたのに対し、第９の実施の形態では下側基板２内面側の信号電極６、各接続配線１８，２１、外面側の信号電極用接続配線１２、走査電極用接続配線１４、信号入力用接続配線４１、これと接続された外部接続端子２６を一括して形成し、また、下側基板２に形成された第１の保護層８２を部分的に剥離する際、外部接続端子２６上および駆動用ＩＣ１０の接続領域上および信号入力用配線４１上に形成された部分を剥離している点である。

【０２２５】また、第８の実施の形態では、駆動用ＩＣ１０等を搭載したＣＯＦ４７を外部接続端子２６に接続して下側基板２の外方に駆動用ＩＣ１０を実装しているのに対し、第９の実施の形態では、信号電極用接続配線１２、走査電極用接続配線１４、および信号入力用接続配線４１の各端部上に駆動用ＩＣ１０をフェイスダウン実装等により実装する点である。

【０２２６】本実施の形態の液晶表示装置の製造方法においては、下側基板２の１辺側を上側基板３の外側に延在させ、その部分に駆動用ＩＣ１０を実装しているので、駆動用ＩＣ１０を実装する領域を設けた分、液晶表示装置の額縁部分は若干広くなるものの、駆動用ＩＣを搭載したＣＯＦ等を接続する必要がなくなり、接続用部品の削減を図ることができる。

【0227】また、非表示領域に駆動用ＩＣ10を実装したことにより、表示領域内に実装する場合と比べて表示領域が小さくなるが、実装時の熱により表示領域に悪影響を及ぼすのを回避でき、表示ムラ等の発生の防止効果が優れる。また、下側基板2が可撓性を有する透明基板である場合には、駆動用ＩＣ10の実装時の熱により下側基板に凹凸が生じる場合があるが、駆動用ＩＣの実装位置が非表示領域であれば、前記凹凸が表示に悪影響を及ぼすことを回避でき、表示品質が良好な液晶表示装置を製造できる。

【0228】［電子機器］前記のいずれかの実施の形態の製造方法で得られた液晶表示装置を備えた電子機器の例について説明する。

【0229】図34は、携帯電話の一例を示した斜視図である。図34において、符号1000は携帯電話本体を示し、符号1001は前記のいずれかの実施の形態の製造方法で得られた液晶表示装置を用いた液晶表示部を示している。

【0230】図35は、腕時計型電子機器の一例を示した斜視図である。図35において、符号1100は時計本体を示し、符号1101は前記のいずれかの実施の形態の製造方法で得られた液晶表示装置を用いた液晶表示部を示している。

【0231】図36は、ワープロ、パソコンなどの携帯型情報処理装置の一例を示した斜視図である。図36において、符号1200は情報処理装置、符号1202はキーボードなどの入力部、符号1204は情報処理装置本体、符号1206は前記のいずれかの実施の形態の製造方法で得られた液晶表示装置を用いた液晶表示部を示している。

【0232】図33～図36に示す電子機器は、前記のいずれかの実施の形態で得られた液晶表示装置を用いた液晶表示部を備えているので、狭額縁化による小型の液晶パネルを備えたことにより装置全体が小型である割に表示領域が広く、携帯性に優れた電子機器を実現することができる。

【0233】なお、本発明の技術範囲は前記実施の形態に限定されるものではなく、本発明の趣旨を逸脱しない範囲において種々の変更を加えることが可能である。例えば第1、第2の実施の形態では反射電極を有するパッシブマトリクス型液晶表示装置においてスルーホールの形成位置が異なる製造例、第3の実施の形態ではカラーフィルターを備えた液晶表示装置の製造例、第4の実施の形態では反射層と表示電極を別個に有する液晶表示装置の製造例、第5の実施の形態ではＴＦＤアクティブマトリクス型液晶表示装置の製造例、第6の実施の形態ではＴＦＴアクティブマトリクス型液晶表示装置の製造例をそれぞれ説明したが、これら実施の形態の特徴点を適宜組み合わせたものであってもよい。

【0234】また、前記実施の形態で例示した製造方法や、実施の形態で製造する各液晶表示装置の構成材料、形状等の具体的な記載に関しては、適宜変更が可能なことは勿論である。また、本発明の液晶装置の製造方法は、直視型のみならず、投射型液晶装置（プロジェクタ）の液晶ライトバルブの製造方法に適用することもできる。

【0235】

【発明の効果】以上、詳細に説明したように本発明の液晶装置の製造方法においては、第1と第2の引き廻し導電部が第1の基板の内面側から基板内部を通って外面側に引き廻しており、さらに、前記第1の基板の外方又は外面側に電子部品を実装しているので、本発明の製造方法で製造された液晶装置では、従来の液晶装置の構成において第1の基板内面の表示領域外側に設けていた引き廻し領域が不要となるので、その分だけ従来の液晶装置に比べて大幅に額縁部分を狭くすることができる。また、表示領域内を含めて第1の基板の外面側全面に引き廻し導電部をレイアウトすることができ、引き廻し導電部間のピッチを余裕を持って設計することができるため、引き廻し抵抗が増大するという問題が生じることもない。また、このように引き廻し導電部の低抵抗化によりクロストークの発生を改善でき、表示品位を向上できる。

【0236】また、表示容量の増加に伴って引き廻し導電部の本数を多くしても、上述したように引き廻し導電部を第1の基板の外面側全面にレイアウトすることができるので、引き廻し領域を第1の基板内面の表示領域外側に設けていた従来の液晶装置と比べて、引き廻し導電部の線幅およびピッチを余裕を持って設計することができ、引き廻し導電部の断線等の不良が発生し難い。

【0237】本発明の製造方法で製造された液晶装置の第1の基板は、液晶装置そのものを構成する一方の基板として機能すると同時に、駆動回路の搭載基板としても機能する。したがって、場合によっては、フレキシブルテープ等の接続用部品の削減を図ることもでき、さらに部品数の削減によるコストダウンおよび液晶装置の小型化が可能である。また、第1の基板の外面側に電子部品が実装された液晶装置を得ることもできるので、対向する第1と第2の基板の端面や周囲に電子部品やこれと接続されたＦＰＣが付いてないため、従来の液晶表示装置のように一方の基板を他方の基板より大きく張り出させてＣＯＦ実装したものやＣＯＧ実装したものと比べて、電子機器に取り付ける際に取り扱い易い。

【0238】さらに、本発明の製造方法では、第1の基板の外面側に電子部品を実装する前に、各導電部と引き廻し導電部が形成された第1と第2の基板をシール材を介して貼り合わしているので、電子部品の実装工程前に、第1と第2の基板の第1と第2の引き廻し導電部とパネル検査機を接続しパネル特性の良否を評価し、合格したものだけに電子部品を実装するようにすれば、不良

の液晶パネルに電子部品を実装しなくても済み、コストの削減が可能である。

【0239】また、前記のように本発明により製造された液晶装置は小型化できるので、電子機器の小型化および低価格化を実現できる。

【図面の簡単な説明】

【図1】　本発明の液晶装置の製造方法の第1の実施の形態で製造された液晶表示装置全体を上面側から見た斜視図である。

【図2】　同、液晶表示装置を下面側から見た斜視図である。

【図3】　同、液晶表示装置を構成する下側基板の上面（電極形成面）図である。

【図4】　同、下側基板を下面側から観た透過平面図である。

【図5】　同、液晶表示装置を構成する上側基板の下面（電極形成面）図である。

【図6】　同、上側基板と下側基板とを重ね合わせた状態を示す透過平面図である。

【図7】　同、液晶表示装置の断面構造を示す図であって、図6のA－A'線に沿う断面図である。

【図8】　同、図6のB－B'線に沿う断面図である。

【図9】　同、液晶表示装置の上下導通部の他の例を示す断面図である。

【図10】　同、液晶表示装置の駆動用ICの実装形態の他の例を示す断面図である。

【図11】　同、下側基板の孔内接続部の例を示す図である。

【図12】　同、孔内接続部の他の例を示す図である。

【図13】　同、孔内接続部のさらに他の例を示す図である。

【図14】　本発明の液晶装置の製造方法の第2の実施の形態で製造された液晶表示装置において、上側基板と下側基板とを重ね合わせた状態を示す透視図である。

【図15】　同、液晶表示装置の断面構造を示す図であって、図14のA－A'線に沿う断面図である。

【図16】　同、図14のB－B'線に沿う断面図である。

【図17】　本発明の液晶装置の製造方法の第3の実施の形態で製造された液晶表示装置の断面構造を示す図であって、図6のA－A'線に相当する断面図である。

【図18】　同、液晶表示装置の断面構造を示す図であって、図6のB－B'線に相当する断面図である。

【図19】　本発明の液晶装置の製造方法の第4の実施の形態で製造された液晶表示装置の断面構造を示す図であって、図6のA－A'線に相当する断面図である。

【図20】　同、液晶表示装置の断面構造を示す図であって、図6のB－B'線に相当する断面図である。

【図21】　同実施の形態において、信号電極と信号電極用接続配線との接続構造の他の例を示す、図6のA－A'線に相当する断面図である。

【図22】　本発明の液晶装置の製造方法の第5の実施の形態で製造された液晶表示装置を示す図であって、（a）全体を上面側から見た斜視図、（b）一画素の拡大図である。

【図23】　本発明の液晶装置の製造方法の第6の実施の形態で製造された液晶表示装置を示す図であって、（a）全体を上面側から見た斜視図、（b）一画素の拡大図である。

【図24】　本発明の液晶装置の製造方法の第1の実施の形態を工程順に示す図であって、（a）走査電極と交差する方向に沿った上側基板の断面図、（b）信号電極に沿った方向の下基板の断面図、（c）電子部品の実装前の液晶セルを示す断面図である。

【図25】　本発明の液晶装置の製造方法の第7の実施の形態で製造された液晶表示装置の断面構造を示す図であって、図6のA－A'線に相当する断面図である。

【図26】　本発明の液晶装置の製造方法の第8の実施の形態で製造された液晶表示装置全体を上面側から見た斜視図である。

【図27】　同、液晶表示装置を下面側から見た斜視図である。

【図28】　同、下側基板を下面側から観た透過平面図である。

【図29】　同、上側基板と下側基板とを重ね合わせた状態を示す透過平面図である。

【図30】　同、液晶表示装置の断面構造を示す図であって、図29のA－A'線に沿う断面図である。

【図31】　同、図29のB－B'線に沿う断面図である。

【図32】　本発明の液晶装置の製造方法の第9の実施の形態で得られた液晶表示装置全体を下面側から見た斜視図である。

【図33】　同、図32のB－B'線に沿う断面図である。

【図34】　本発明の電子機器の一例を示す斜視図である。

【図35】　本発明の電子機器の他の例を示す斜視図である。

【図36】　本発明の電子機器のさらに他の例を示す斜視図である。

【図37】　COF実装を適用した従来の液晶装置の一例を示す斜視図である。

【図38】　COG実装を適用した従来の液晶装置の一例を示す斜視図である。

【図39】　従来のパッシブマトリクス型液晶装置における上側基板の構成を示す平面図である。

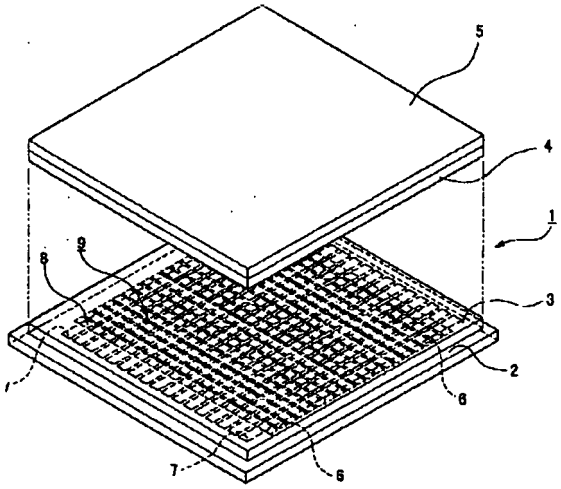
【図40】　同、下側基板の構成を示す平面図である。

【符号の説明】

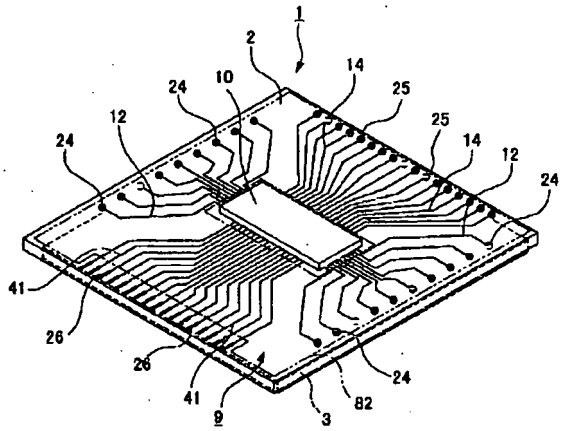
1，50，52，58，61，73，85，91，92

液晶表示装置（液晶装置）
2　下側基板（第１の基板）
2a　凹部
3　上側基板（第２の基板）
5　偏光板（偏光手段）
6　信号電極（第１の導電部）
7　走査電極（第２の導電部）
10，32　駆動用ＩＣ（電子部品）
11　信号電極用引き廻し配線（第１の引き廻し導電部）
12　信号電極用接続配線（第１の外面上接続部）
13　走査電極用引き廻し配線（第２の引き廻し導電部）
14　走査電極用接続配線（第２の外面上接続部、第２の引き廻し導電部の第１の部分の一部）
15，30，44，46　孔内接続部（第１の孔内接続部）
17，38　スルーホール
18　信号電極用接続配線
19，39，40　上下導通部（基板間接続部、第２の引き廻し導電部の第２の部分）
20　孔内接続部（第２の孔内接続部、第２の引き廻し導電部の第１の部分の一部）
21　走査電極用接続配線（第２の内面上接続部）
26　外部接続端子
27　シール材
28　液晶層
42　内部導電層
43，45　ビアホール
54　カラーフィルター
59　反射層
62，74　素子基板（第１の基板）
63，75　対向基板（第２の基板）
64　データ線（第１の導電部）
66　ＴＦＤ素子
67　走査線（第２の導電部）
76　ソース線（データ線、第１の導電部）
77　ゲート線（走査線、第１の導電部）
78　ＴＦＴ素子
80　共通電極（第２の導電部）
82　第１の保護層
84　第２の保護層

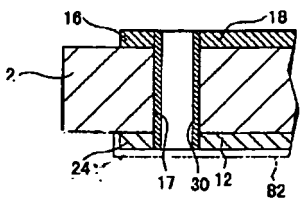
【図１】



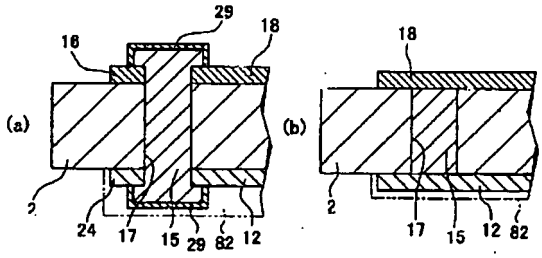
【図２】



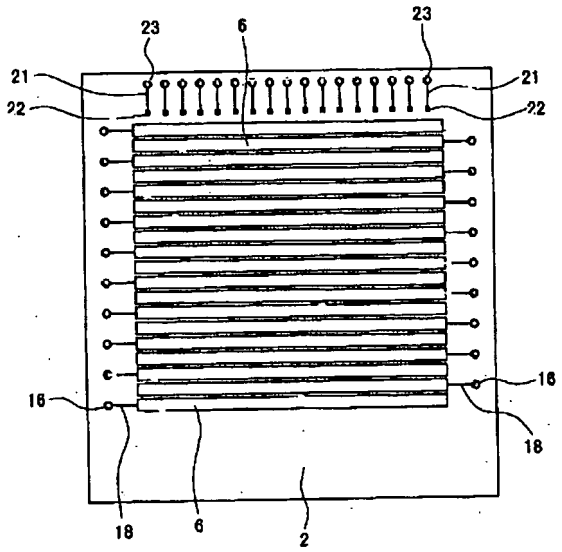
【図１２】



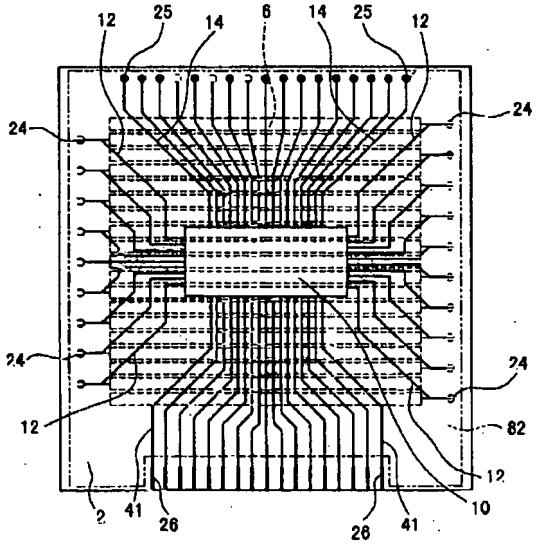
【図１１】



【図3】



【図4】



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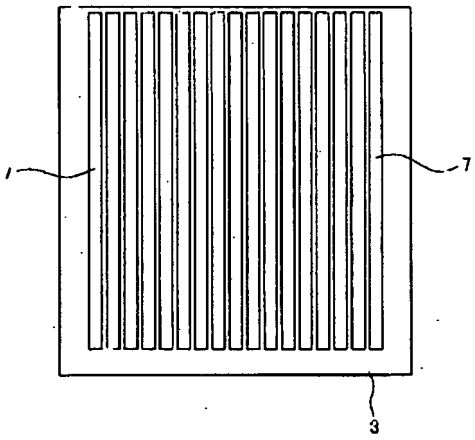

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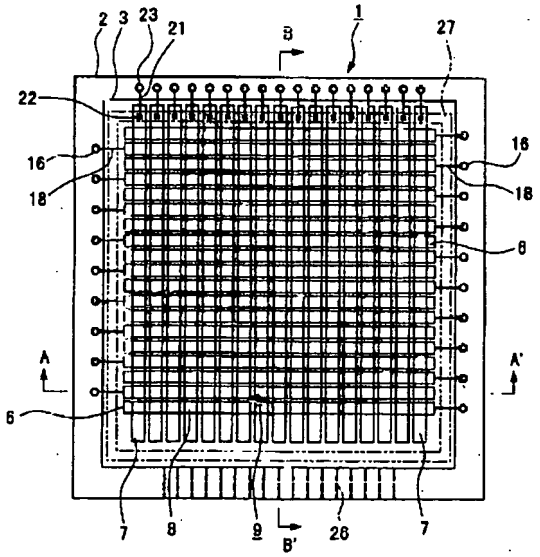

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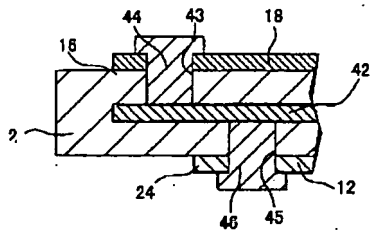

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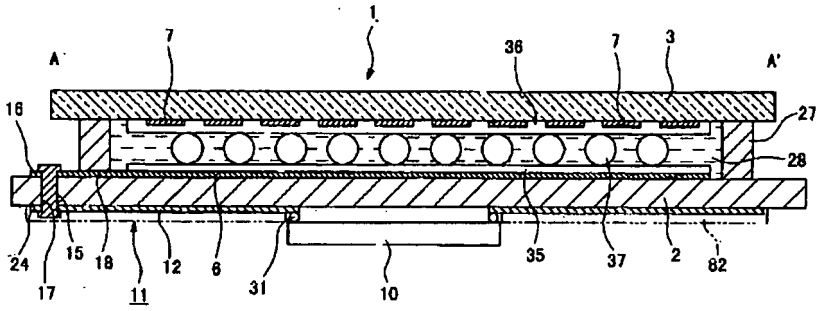
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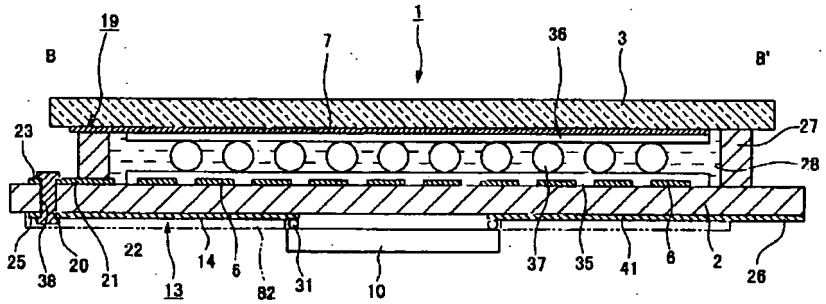
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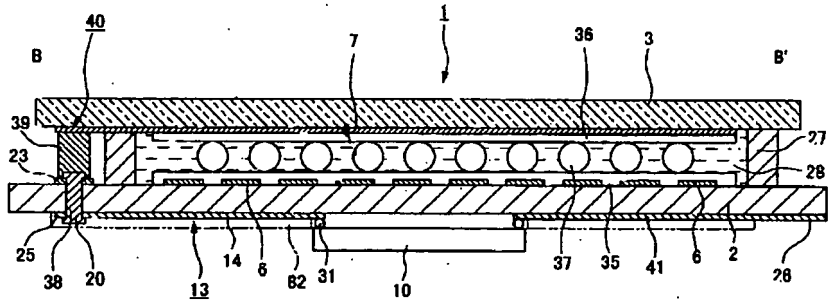
【図9】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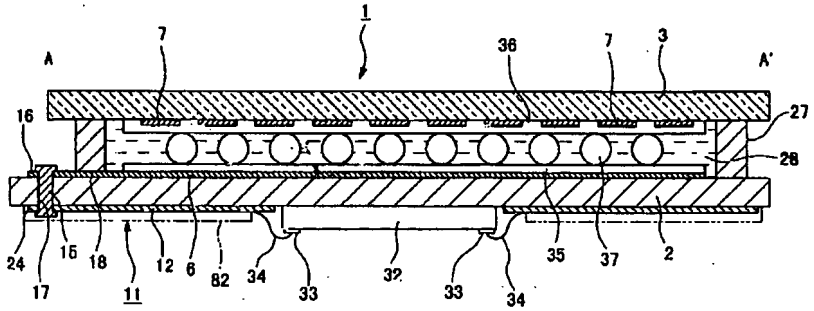
【図10】



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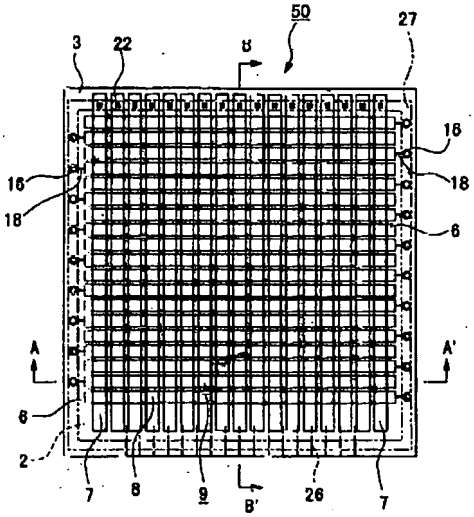

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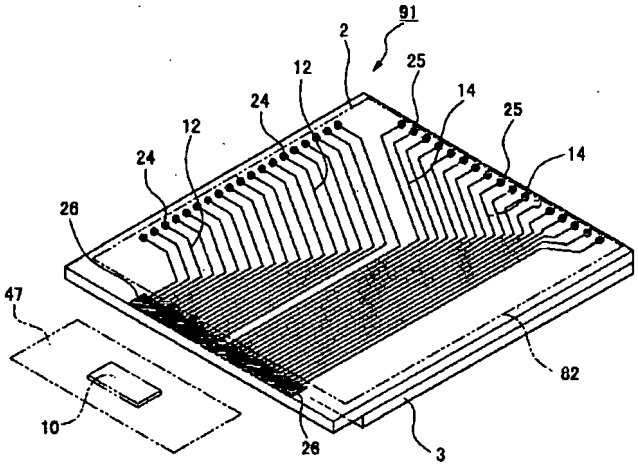

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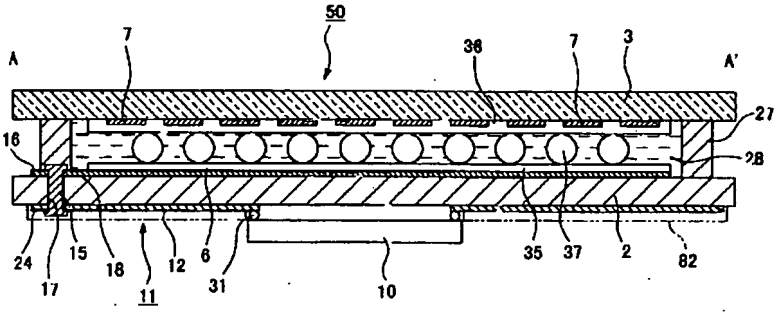

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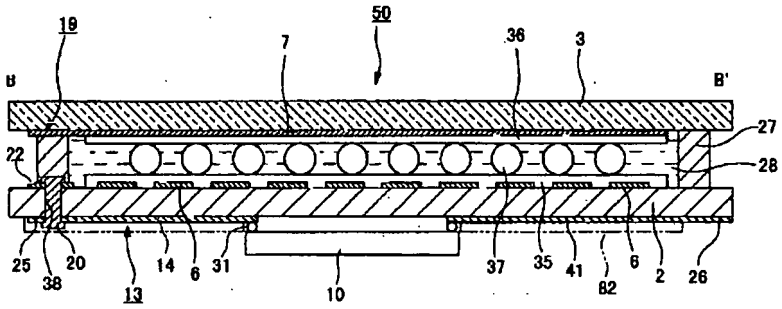

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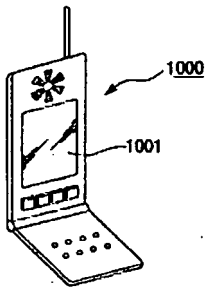

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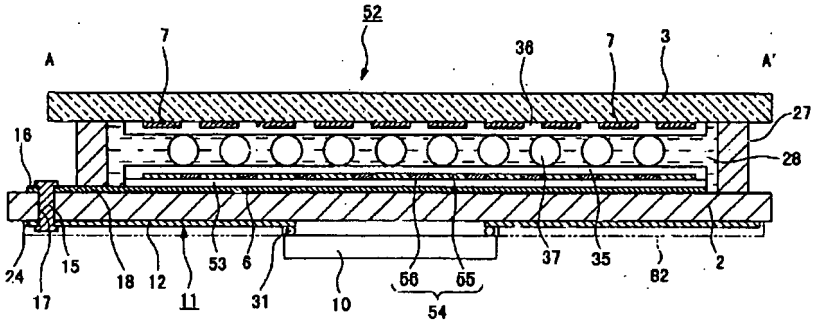

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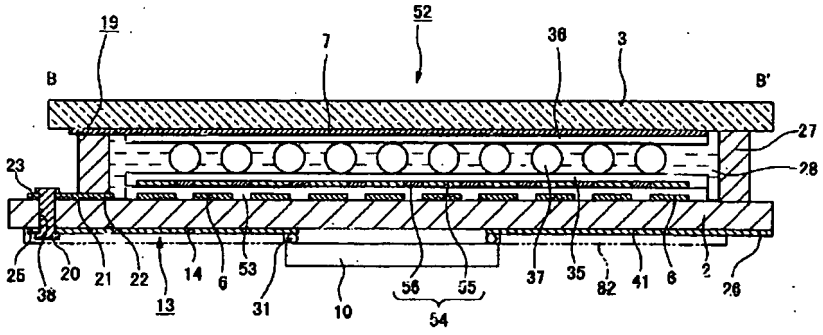

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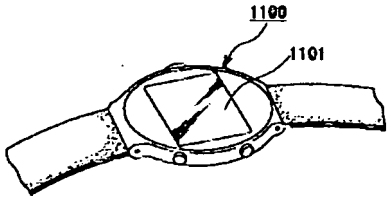

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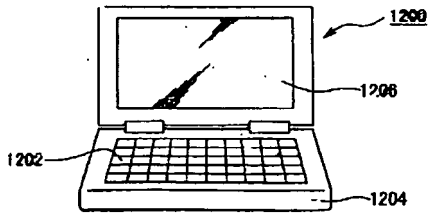

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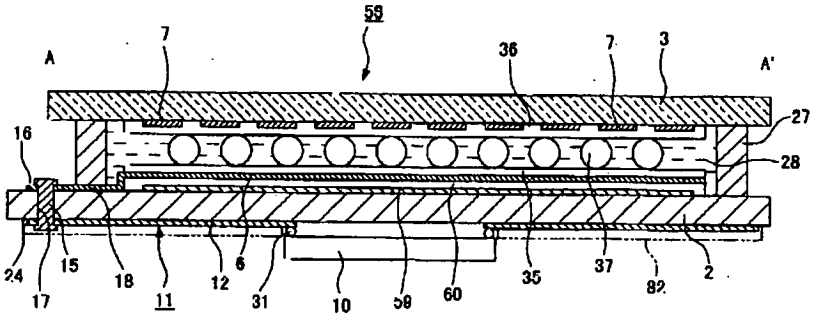
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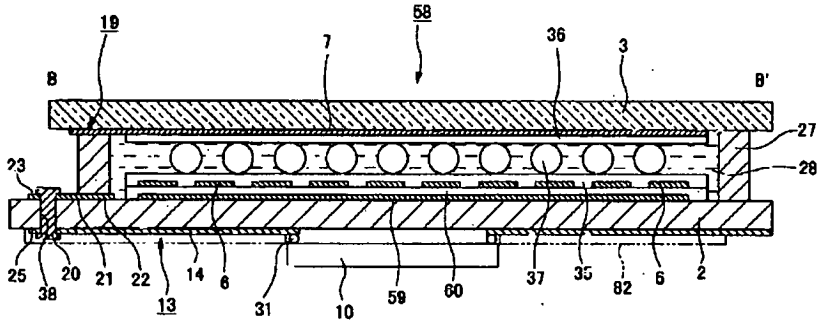
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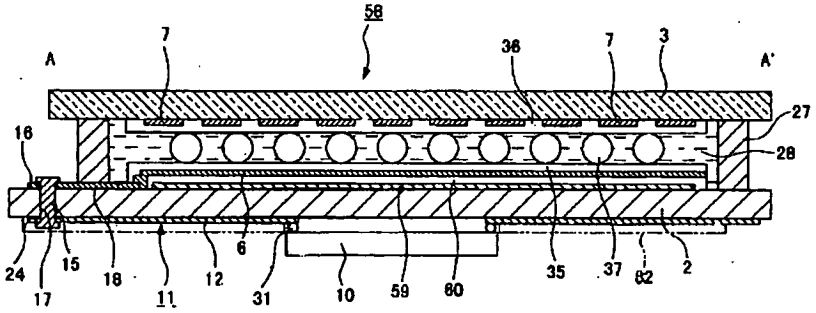
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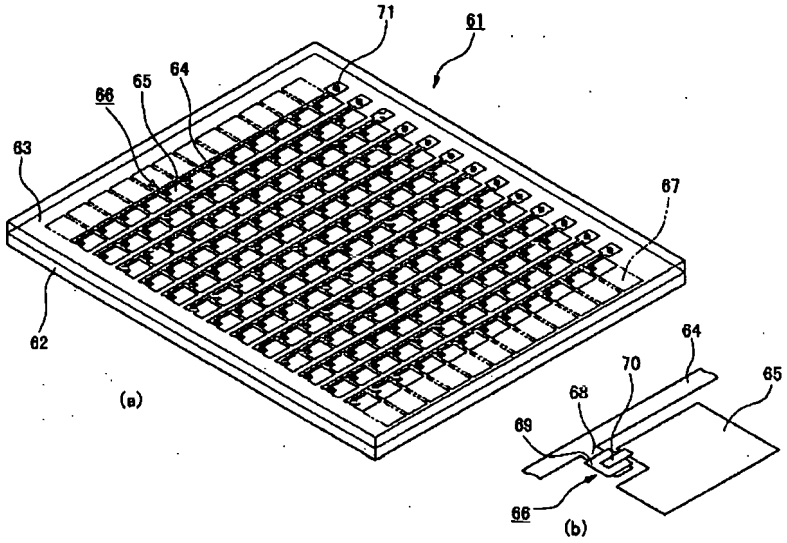

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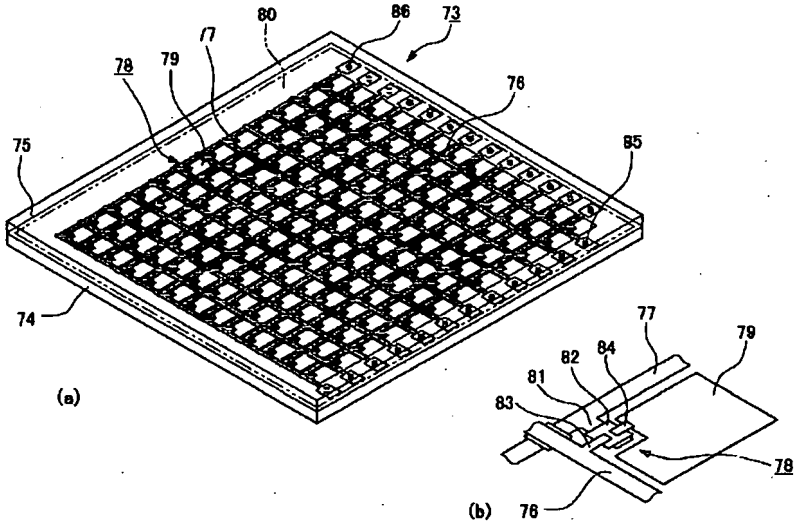

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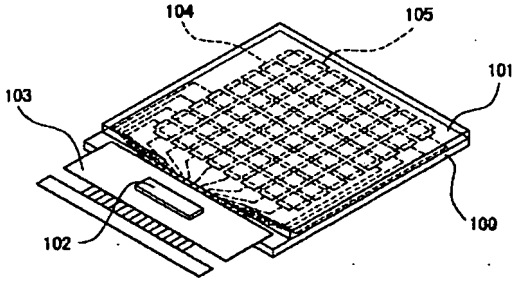

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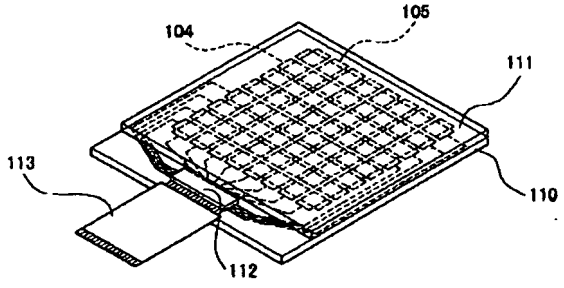

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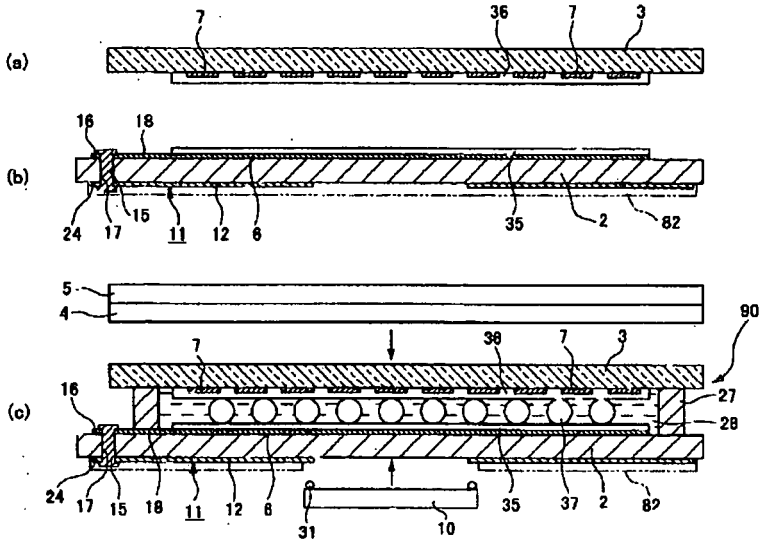
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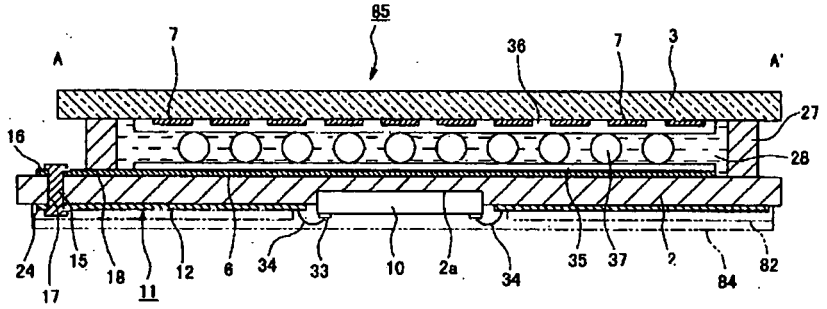
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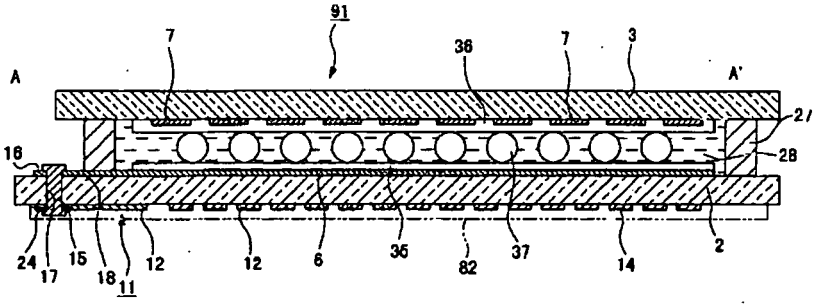
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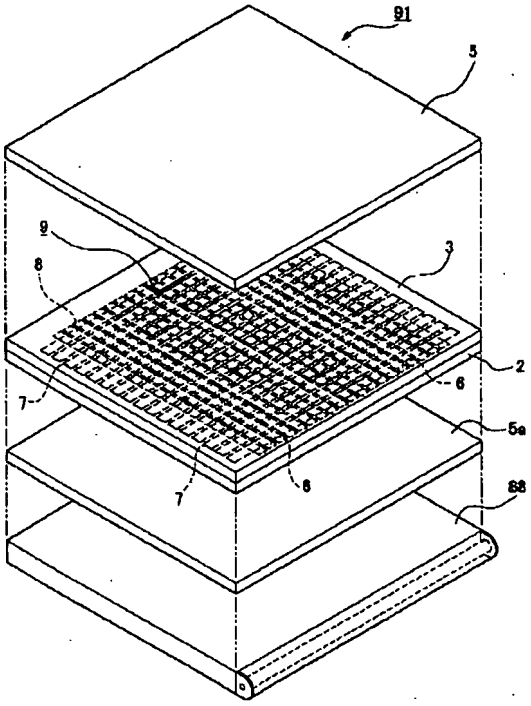
【図26】



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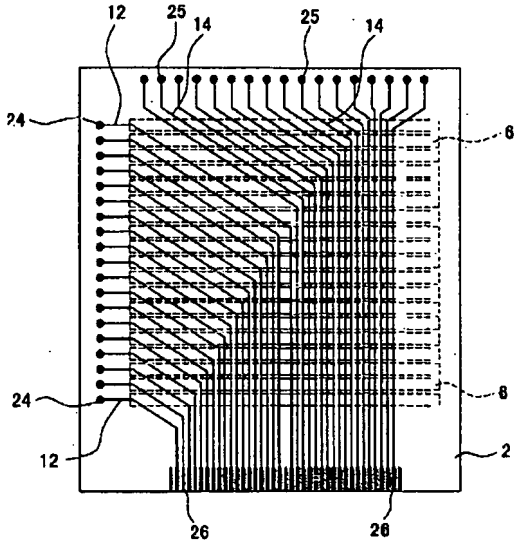

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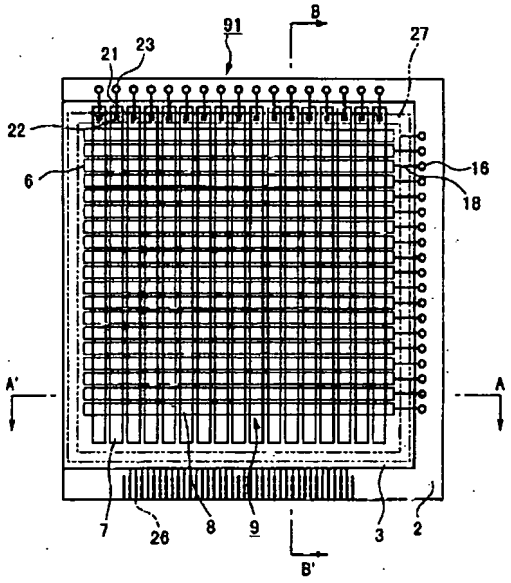

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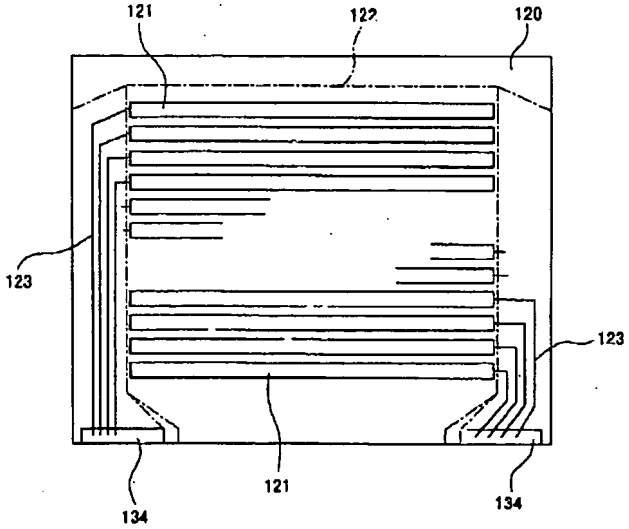

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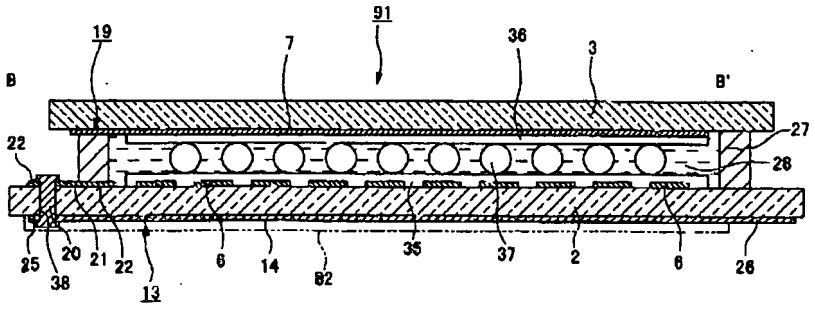
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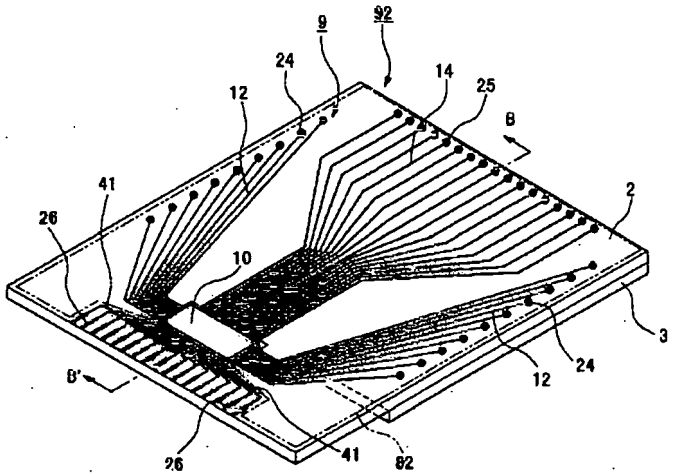
【図32】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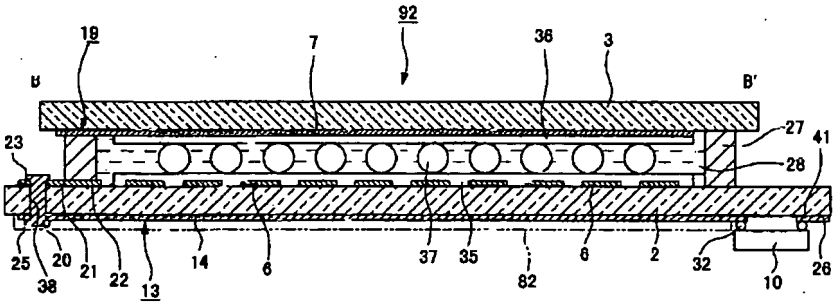
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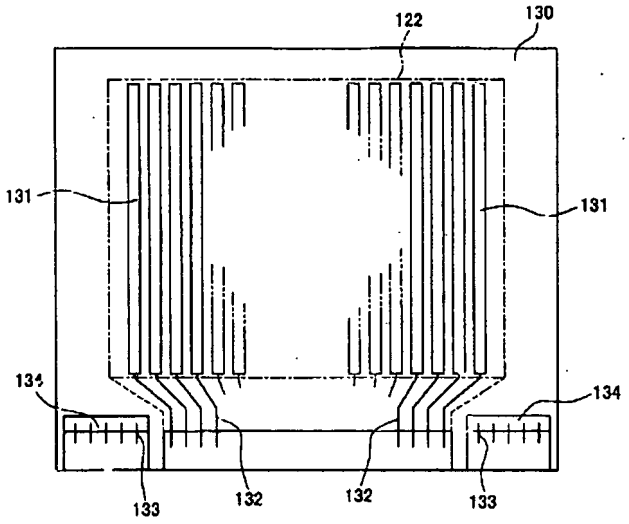
【図40】



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MOMOSE YOICHI
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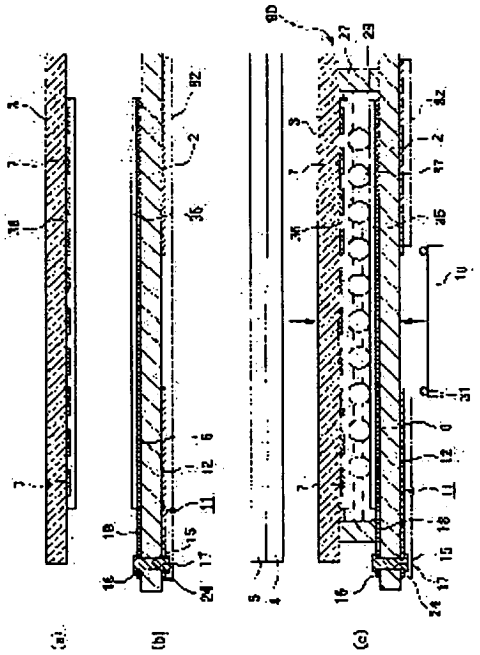
(54) METHOD FOR MANUFACTURING LIQUID CRYSTAL DEVICE, LIQUID CRYSTAL DEVICE AND ELECTRONIC EQUIPMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method for manufacturing a liquid crystal device which can be miniaturized by making the frame narrow without causing any decrease in display quality.
SOLUTION: In this method, the liquid crystal device having a liquid crystal layer 28 sandwiched between 1st and 2nd substrates 2 and 3 stuck together with a seal material 27 opposite each other is manufactured through a substrate sticking stage where the 1st substrate 2 and 2nd substrate 3 are stuck together through a seal material 27 so that a signal electrode 6 and the scanning electrode 7 face each other on the internal surfaces and a laying wiring for a scanning electrode allows upper-lower conduction between a pair of substrates 2 and 3, and then a mounting stage where a driving IC 10 is mounted on the external surface of the 1st substrate 2 and electrically connected to a wire 11 and the laying wiring for the scanning electrode.



LEGAL STATUS

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[Date of sending the examiner's decision of rejection]

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[Date of final disposal for application]

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[Date of registration]

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[Date of extinction of right]

整理番号　J010475502
発送番号　270254
発送日　　平成19年 6月 5日

拒絶理由通知書

特許出願の番号	特願２００６－０４０９２７
起案日	平成１９年　５月３１日
特許庁審査官	北川　創　　９８０４　２１００
特許出願人代理人	西　和哉（外　２名）　様
適用条文	第２９条第２項

<<<<　最　後　>>>>

この出願は、次の理由によって拒絶をすべきものである。これについて意見があれば、この通知書の発送の日から６０日以内に意見書を提出して下さい。

理　由

この出願の下記の請求項に係る発明は、その出願前に日本国内又は外国において、頒布された下記の刊行物に記載された発明又は電気通信回線を通じて公衆に利用可能となった発明に基いて、その出願前にその発明の属する技術の分野における通常の知識を有する者が容易に発明をすることができたものであるから、特許法第２９条第２項の規定により特許を受けることができない。

記　　（引用文献等については引用文献等一覧参照）

請求項１、５－１０
引用文献１、２
備考：
引用文献１には、「ガラス基板に透光性を有する所定パターンの導電膜を設け、該ガラス基板を一対にして各々の該導電膜側を対向させ、また該ガラス基板の間に電気光学媒体を挟持させ、該導電膜は液晶を駆動させるための電極として用いた液晶表示装置において、該導電膜を無線通信用の送信アンテナ或いは受信アンテナとして利用するために、該導電膜にアンテナ用のインピーダンス整合回路を結合した液晶表示装置」が記載されている。「無線通信用の送信アンテナ或いは受信アンテナ」は、表示部を構成する導電体と同層、同一材料、同一工程で形成された導電体により構成されているものと認められる。
引用文献１の【００１０】には、「ＲＬＣ回路としては、ガラス基板の導電膜が形成されていない対向面に所定の接地導体層を設けてガラス基板に直接マイクロストリップ回路によってＲＬＣ回路を形成することも可能である」ことが記載されている。対向面に形成されたＲＬＣ回路と、導電膜により形成された「無線通信用の送信アンテナ或いは受信アンテナ」との間を電気的に接続する中継導電体が、対向面に形成されるべきことは自明である。また、ＲＬＣ回路を、集積回路により形成することは、設計事項の範囲内である。
一方、引用文献２には、液晶装置において、狭額縁化による小型化を図るために、下側基板２の外面上に、ＩＣ１０と電気的に接続される信号電極用接続配線１２と走査線用接続配線１４を形成することが記載されている（【０１９１】参照）。
引用文献１に記載の発明において、狭額縁化による小型化を図るために、引用文献２に記載のように、導電膜と駆動ＩＣとの間を電気的に接続する接続配線を、ガラス基板１の対向面上に形成することは、当業者が容易に想到することができたことである。
そして、このように形成された液晶表示素子において、ＲＬＣ回路とアンテナとを電気的に接続する対向面に形成される中継電極は、表示部駆動用配線（ガラス基板１の対向面上に形成された接続配線）を構成する導電体と同層であり、かつアンテナの少なくとも一部を構成する導電体（導電膜）とは異なる層により形成されたものである。
請求項５、６については、引用文献１に記載の発明の導電膜は無線通信用の送信アンテナとして利用されるものである。

請求項７、８については、アンテナの少なくとも一部を基板の表示部以外または基板の周縁部に形成することは、表示部への支障やスペース等を勘案して当業者が適宜なし得る設計的事項にすぎない。
請求項９については、基板上のアンテナよりも上層側に形成されて表示装置を構成する導電体がアンテナと平面的に重ならない位置に配置することは、通信上の支障の程度等に応じて当業者が適宜なし得る設計的事項にすぎない。

請求項４
引用文献１－５
備考：
引用文献３－５にも記載されているように、基板にアンテナ及び集積回路を設けたＩＣタグは周知であり、引用文献１に記載の発明においても、装置に関わる情報を記憶する集積回路を設けることは、当業者が容易に想到することができたことである。

請求項１１、１２
引用文献１－６
備考：
無線通信デバイスにおいて、電流の流れを一方向に規制する整流部を有し、アンテナが電磁誘導を利用して外部から充電部に電力を充電するように構成することは、引用文献６の【００５８】にも記載されているように周知である。

請求項１３－１５
引用文献１－５、７
備考：
引用文献７の［００３５］には、ＬＣＤ窓６１１にＰＯＤ（Printed-On-Display）アンテナを有する両面ＬＣＤ型携帯通信端末が記載されている。

請求項１６－２４
引用文献１－７
備考：
ＩＣタグが読み取り、書き込みされた情報を記憶すること、ＩＣタグの情報を表示することは、引用文献３－５にも記載されているように周知である。

＜拒絶の理由を発見しない請求項＞
請求項２、３に係る発明については、現時点では、拒絶の理由を発見しない。拒絶の理由が新たに発見された場合には拒絶の理由が通知される。

引　用　文　献　等　一　覧

１．特開平０７－０２０４２１号公報
２．特開２００２－０４０４７２号公報
３．特開２００２－３１２７４８号公報
４．特開２００１－３１９０４３号公報
５．特開平０８－２７６４５８号公報
６．特開２００２－１４２３５６号公報
７．米国特許出願公開第２００３／１６１７８号明細書

最後の拒絶理由通知とする理由

最初の拒絶理由通知に対する応答時の補正によって通知することが必要になった拒絶の理由のみを通知する拒絶理由通知である。

この拒絶理由通知書について不明な点があるとき、または、この出願について面接を希望されるときは、下記にご連絡下さい。

特許審査第一部 ナノ物理（エネルギー線応用）　北川　創
ＴＥＬ　０３－３５８１－１１０１　（内線３２７４）

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] A liquid crystal layer is pinched between the substrates of the pair which counters mutually and was stuck by the sealant. Among the substrates of said pair to the 1st substrate While the 1st current carrying part is prepared on the inside of the side which faces said liquid crystal layer and connecting with this 1st current carrying part electrically, the 1st electrically connected on this inside and the external surface of the opposite side from said inside lengthens about through said 1st interior of a substrate, and a current carrying part is formed. The 2nd current carrying part is prepared on the inside of the side which faces the 2nd substrate among the substrates of said pair at said liquid crystal layer. While the vertical flow between the substrates of said pair connects with said 2nd current carrying part electrically, the 2nd electrically connected on this inside and the external surface of the opposite side from the inside of said 1st substrate lengthens about further through said 1st interior of a substrate, and a current carrying part is formed. It is the manufacture approach of liquid crystal equipment that the electronic parts which said 1st [the] lengthened about on the external surface of said 1st substrate, and a current carrying part and/or said 2nd [the] lengthened about, and were electrically connected with the current carrying part were mounted. While sticking said the 1st substrate and said 2nd substrate through said sealant so that said the 1st current carrying part and 2nd current carrying part may counter inside mutually After said substrate lamination process of the 2nd lengthening about and performing said vertical flow between the substrates of said pair in a current carrying part, The manufacture approach of the liquid crystal equipment characterized by having the mounting process which mounts said electronic parts on the external surface of said 1st substrate, and said 1st [the] lengthens about, and a current carrying part and/or said 2nd [the] lengthen about, and is electrically connected with a current carrying part.
[Claim 2] The manufacture approach of the liquid crystal equipment according to claim 1 characterized by establishing the process which the 1st lengthens about on the external surface of the 2nd substrate and the 1st substrate in front of lamination at least, and the 2nd lengthens about on it with a current carrying part, and forms the 1st protective layer of a wrap in it for a current carrying part.
[Claim 3] The manufacture approach of the liquid crystal equipment according to claim 2 characterized by having the process which exfoliates said 1st protective layer partially before the mounting process of electronic parts.
[Claim 4] The manufacture approach of the liquid crystal equipment according to claim 2 or 3 characterized by having the inspection process of the 1st and the 2nd substrate which were stuck at said substrate lamination process between the partial exfoliation process of said 1st protective layer, and the mounting process of said electronic parts.
[Claim 5] The manufacture approach of liquid crystal equipment given in claim 1 characterized by embedding said some of electronic parts [at least] in the mounting process of said electronic parts in the crevice beforehand formed in said 1st substrate thru/or any 1 term of 4.
[Claim 6] The manufacture approach of liquid crystal equipment given in claim 1 which said electronic parts, the 1st, and the 2nd lengthen about, and is characterized by having the process which forms the 2nd protective layer of a wrap in a connection with a current carrying part at least after the mounting process of said electronic parts at the external surface side of the 1st substrate thru/or any 1 term of 5.

[Claim 7] The manufacture approach of liquid crystal equipment given in claim 1 characterized by using the substrate which has flexibility as said the 1st substrate and/or said 2nd substrate thru/or any 1 term of 6.
[Claim 8] The manufacture approach of the liquid crystal equipment according to claim 7 characterized by using for the interior of a substrate the substrate which has the internal current carrying part of one or more layers as said 1st substrate.
[Claim 9] The manufacture approach of liquid crystal equipment given in claim 1 characterized by using what the 1st current-carrying-part [by the side of an inside] and external surface side lengthened about, and constituted the current carrying part from same conductive ingredient as said 1st substrate thru/or any 1 term of 8.
[Claim 10] The manufacture approach of liquid crystal equipment given in claim 1 characterized by using what constituted from a conductive ingredient which the 1st by the side of the 1st current carrying part by the side of an inside and external surface lengthens about, and is different in a current carrying part as said 1st substrate thru/or any 1 term of 8.
[Claim 11] The manufacture approach of liquid crystal equipment given in claim 1 which is on the external surface of the 1st substrate and is characterized by mounting said electronic parts in the part corresponding to a non-display field in the mounting process of said electronic parts thru/or any 1 term of 10.
[Claim 12] The manufacture approach of liquid crystal equipment given in claim 1 characterized by using that by which the external connection terminal electrically connected with the input terminal of said electronic parts was prepared in the external surface side periphery section as said 1st substrate in said substrate lamination process thru/or any 1 term of 11.
[Claim 13] The manufacture approach of liquid crystal equipment given in claim 1 characterized by using that in which the external connection terminal which said 1st [the] lengthened about in the external surface side periphery section as said 1st substrate in said substrate lamination process, and a current carrying part and said 2nd [the] lengthened about, and was electrically connected with the current carrying part was prepared thru/or any 1 term of 11.
[Claim 14] While the 1st current carrying part is prepared on the inside which is liquid crystal equipment with which the liquid crystal layer was pinched between the substrates of the pair by which opposite arrangement was carried out mutually, and faces said liquid crystal layer in the 1st substrate among the substrates of said pair The 1st electrically connected with this 1st current carrying part lengthens about, and a current carrying part is prepared covering said inside and external surface of the opposite side through the interior of a substrate from said inside. While the 2nd current carrying part is prepared on the inside which faces said liquid crystal layer in the 2nd substrate which has translucency The 2nd electrically connected with this 2nd current carrying part lengthens about. A current carrying part to the inside of said 1st substrate, from the inside of said 2nd substrate Furthermore, it is prepared covering the external surface of the 1st substrate through the interior of a substrate from the inside of the 1st substrate. The electronic parts which said 1st [the] lengthened about to the way or external surface side outside said 1st substrate, and a current carrying part and said 2nd [the] lengthened about, and were electrically connected with the current carrying part are mounted. Liquid crystal equipment characterized by for the 1st having lengthened about at least to the external surface side of said 1st substrate, and for the 2nd having lengthened about with the current carrying part, and preparing a current carrying part in the 1st protective layer of a wrap.
[Claim 15] The electronic parts mounted in the external surface side of said 1st substrate are liquid crystal equipment according to claim 14 characterized by embedding at least the part at said 1st substrate.
[Claim 16] Liquid crystal equipment according to claim 14 or 15 characterized by for said electronic parts, the 1st, and the 2nd having lengthened about at least to the external surface side of the 1st substrate with which said electronic parts were mounted, and preparing a connection with a current carrying part in the 2nd protective layer of a wrap.
[Claim 17] Liquid crystal equipment according to claim 14 characterized by said the 1st substrate and/or said 2nd substrate consisting of substrates which have flexibility.
[Claim 18] Liquid crystal equipment given in claim 14 which is on the external surface of said 1st substrate, and is characterized by mounting said electronic parts in the part corresponding to a non-

display field thru/or any 1 term of 17.
[Claim 19] Electronic equipment characterized by equipping claim 14 thru/or any 1 term of 18 with the liquid crystal equipment of a publication.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the liquid crystal display panel of the structure which narrowed the field besides a viewing area as much as possible especially in the miniaturization of liquid crystal equipment about the manufacture approach, and the liquid crystal equipment and electronic equipment of liquid crystal equipment.
[0002]
[Description of the Prior Art] In recent years, in portable electronic devices, such as a notebook computer, a portable telephone, and a wrist watch, the liquid crystal display panel is widely used as a means to display various kinds of information. A liquid crystal display panel is held in the space where the interior of a case was especially restricted with the portable electronic device, from the demand of wanting to make [many] the amount of information which can moreover be displayed, it is large as much as possible in a viewing area, and a configuration which narrows the part besides a viewing area (this part is hereafter called a non-display field or frame on these specifications) is desired.
[0003] Usually, in this kind of liquid crystal display, and the liquid crystal display called especially a passive matrix (passive matrix) mold, liquid crystal is enclosed between two transparence substrates, and the transparent electrode of the shape of a stripe which intersects perpendicularly with the opposed face of each transparence substrate mutually is formed. In this liquid crystal display, the part which the transparent electrode on two substrates intersects mutually serves as a pixel, and the method which drives liquid crystal from the outside for every pixel is adopted. In order to drive liquid crystal from the outside, the non-display field for example, on each transparence substrate was made to jut out over the outside of the substrate which counters mutually, IC for a drive which supplies a signal to the field to the transparent electrode of each substrate was mounted, respectively, and the configuration which lengthens about the terminal and each transparent electrode of each IC for a drive, and is electrically connected using wiring was adopted.
[0004] however, after that, for the purpose of reduction of narrow-picture-frame-izing of a liquid crystal display panel, and the number of use of IC for a drive etc., in being the small-scale panel which does not have so many pixels a large number which prepared all the electrodes on two transparence substrates in the non-display field on one substrate lengthen about, wiring is made to flow, and it these-****** -- the method driven by one IC for a drive linked to wiring was proposed. Drawing 37 and drawing 38 show the example of a configuration of the liquid crystal display of this method.
[0005] Drawing 37 joined the circuit board of the gestalt called the so-called COF (Chip On Film) mounting which mounted the chip on the film (flexibility) substrate to the liquid crystal display panel, the one-side side of the bottom substrate 100 has jutted it out over the outside of the top substrate 101, and the flexible-printed-wiring substrate 103 (it is written as FPC Flexible Printed Circuit and the following) with which one IC102 for a drive was carried in this part is joined electrically. Many stripe-like electrodes 104,105 are formed in the direction which intersects perpendicularly with the opposed face of the bottom substrate 100 and the top substrate 101 mutually.
[0006] Drawing 38 is the thing of the gestalt called the so-called COG (Chip On Glass) mounting

which mounted the chip on the glass substrate, the one-side side of the bottom substrate (glass substrate) 110 has jutted out into the outside of the top substrate 111, IC112 for a drive is directly carried in this part, and FPC113 for supplying a driving signal is further joined to IC112 for a drive electrically.

[0007] Even if it makes it which gestalt, it lengthens about for the electrodes of a bottom substrate, and lengthens about for the electrodes of wiring and a top substrate, and all wiring is brought together in the one-side side of the bottom substrate with which FPC and IC for a drive were mounted.

[0008] The top substrate which constitutes a liquid crystal display panel, and a bottom substrate lengthen about, and an example of the connection structure of wiring is explained to a detail using drawing 39 and drawing 40 . Drawing 39 is the electrode and the top view in which lengthening about and showing arrangement of wiring of the top substrate 120, and drawing 40 is the electrode and the top view in which lengthening about and showing arrangement of wiring of the bottom substrate 130. As shown in drawing 39 , in the top substrate 120, many scan electrodes 121 of the shape of a strip of paper which extends in the longitudinal direction in drawing are arranged in the shape of a stripe. Here, the field in which many scan electrodes 121 were formed turns into the viewing area 122 as a liquid crystal display. And outside the viewing area 122, to the non-display field of a way (right-hand side and left-hand side of the viewing area 122 in drawing), it object[for scan electrodes]-****** to each scan electrode 121 for supplying a signal, and wiring 123 is arranged, respectively. It lengthens about, and after [this] wiring 123 is pulled out in the extension direction of an electrode, it is crooked and is brought together in the both ends by the side of one side of the top substrate 120 (side by the side of drawing Nakashita).

[0009] On the other hand, as shown in drawing 40 , many signal electrodes 131 of the shape of a strip of paper which extends in the bottom substrate 130 in the direction (lengthwise direction in drawing) which intersects perpendicularly with the scan electrode 121 formed in the top substrate 120 are arranged in the shape of a stripe. And outside the viewing area 122, to the non-display field of a way (bottom center section of the viewing area 122 in drawing), it object[for signal electrodes]-****** to each signal electrode 131 for supplying a signal, and wiring 132 is arranged, respectively. moreover, the object for the scan electrodes for the top substrate 120 object[for scan electrodes]-******(ing) to the method of both sides of these fields where it object[for signal electrodes]-******(ed), and wiring 132 has been arranged, and connecting with wiring 123 electrically -- ******(ing) -- wiring 133 -- the number of the scan electrodes 121, and the same number -- it is arranged. moreover -- this -- it object[for scan electrodes]-******, and the top substrate 120 object[for scan electrodes]-****** the pitch of wiring 133, and it is in agreement with the pitch of wiring 123. In addition, in this example of a configuration, all lengthen about, and wiring 123,132 is formed in the scan electrode 121 or a signal electrode 131, and one, and is formed by transparence electric conduction film, such as an indium stannic acid ghost (it is written as ITO Indium Tin Oxide and the following).

[0010] If the top substrate 120 and the bottom substrate 130 of said configuration are stuck, the appearance of the **** [appearance / of the bottom substrate 130] substrate 120 is smaller, and it object[for scan electrodes]-****** on the top substrate 120, and object[for scan electrodes]-****** on the lower limit of wiring 123, and the bottom substrate 130, and it is located so that the upper limit of wiring 133 may counter in the vertical flow section shown with the sign 134 in drawing. The electric conduction material containing for example, the anisotropy electric conduction film, conductive paste, and a conductive particle etc. is prepared in the vertical flow section 134, it object[for scan electrodes]-****** on the top substrate 120 through this, and object[for scan electrodes]-****** on wiring 123 and the bottom substrate 130, and wiring 133 is connected electrically. Thus, since it means that it object[for signal electrodes]-****** and wiring 132 was brought together in the one-side side of the bottom substrate 130, if all object[for scan electrodes]-******, and connection between wiring 133 and all the substrates by which COF mounting was carried out as shown in this part at drawing 37 is made, a signal can be supplied from one IC for a drive on a COF mounting substrate to all scan electrodes 121 and signal electrodes 131.

[0011]

[Problem(s) to be Solved by the Invention] However, the following troubles were shown in the liquid

crystal display of said configuration. That is, the field which lengthens about on the outside of a viewing area as mentioned above, and forms wiring is surely needed for the substrate which constitutes the conventional liquid crystal display. As mentioned above, it is in the inclination which display capacity increases increasingly in a liquid crystal display in recent years, but since [this] it lengthens about, and the number of wiring increases, it lengthens about and the formation field of wiring becomes large, this serves as a failure of narrow-picture-frame-izing, so that display capacity (pixel number) increases.

[0012] Although lengthening about and making small the pitch (wiring width-of-face + wiring spacing) of wiring is also considered in order to lengthen about even if it increases display capacity, and to make it a wiring formation field not become large, it lengthens about in that case, increase of wiring resistance is invited, and a possibility of giving a bad influence to display quality is. For example, when [of 100] lengthening about and forming wiring in 50-micrometer pitch, 5mm extent lengthens about and a wiring formation field is needed. It lengthens about at this time, and resistance may reach even several k ohm-M omega order, and problems, such as a signal wave form provincial accent, may produce it.

[0013] In order to lengthen about and to suppress resistance increase of wiring, there are approaches, such as addition of the reduction in resistance of the transparence electric conduction film which lengthens about and constitutes wiring, and metal auxiliary wiring of low resistance. However, in the case of the former approach, it is important for the transparence electric conduction film to secure light transmittance sufficient in the part of an electrode, and the reduction in resistance [with high permeability maintained] is difficult. Moreover, in the case of the latter approach, there is a problem that the load of a production process increases. An effective means to have lengthened about and to attain contraction-ization of a wiring formation field did not exist until now, without lengthening about and increasing resistance of wiring despite a join office.

[0014] Moreover, with the conventional liquid crystal display, as shown in drawing 37 and drawing 38 , since the field which mounts FPC and IC for a drive was required, when one substrate had to be made to jut out of the substrate of another side greatly and a liquid crystal display was held in the case of electronic equipment, this part had become useless space. Therefore, it had led to reservation of the non-display (frame) field of a liquid crystal display, and expansion.

[0015] In addition, the technique of carrying an electronic circuitry and IC for a drive in the rear-face side of a substrate for the purpose of narrow-picture-frame-izing of a liquid crystal display is indicated by JP,5-323354,A. Similarly, the technique of making the function as a pixel pattern wiring substrate and a drive circuit wiring substrate using also [substrate / one] is indicated by JP,7-159802,A. However, this official report is made to merely flow through the drive wire by the side of the front face of the substrate which is only one side in a rear-face side through a beer hall (contact hole), connecting with the drive circuit and IC for a drive by the side of a rear face is only indicated, and the whole liquid crystal display configuration is an unknown.

[0016] This invention is made in order to solve the aforementioned technical problem, and it aims at offering the manufacture approach of liquid crystal equipment that the miniaturization by narrow-picture-frame-izing can be attained, and the electronic equipment using the liquid crystal equipment and this which were obtained by this manufacture approach, without lengthening about and causing deterioration of the display quality by increase of resistance etc.

[0017]

[Means for Solving the Problem] In order to attain the aforementioned purpose, the manufacture approach of the liquid crystal equipment of this invention A liquid crystal layer is pinched between the substrates of the pair which counters mutually and was stuck by the sealant. Among the substrates of said pair to the 1st substrate While the 1st current carrying part is prepared on the inside of the side which faces said liquid crystal layer and connecting with this 1st current carrying part electrically, the 1st electrically connected on this inside and the external surface of the opposite side from said inside lengthens about through said 1st interior of a substrate, and a current carrying part is formed. The 2nd current carrying part is prepared on the inside of the side which faces the 2nd substrate among the substrates of said pair at said liquid crystal layer. While the vertical flow between the substrates of said pair connects with said 2nd current carrying part electrically, the 2nd electrically connected on this inside and the external surface of the opposite side from the inside of

said 1st substrate lengthens about further through said 1st interior of a substrate, and a current carrying part is formed. It is the manufacture approach of liquid crystal equipment that the electronic parts which said 1st [the] lengthened about on the external surface of said 1st substrate, and a current carrying part and/or said 2nd [the] lengthened about, and were electrically connected with the current carrying part were mounted. While sticking said the 1st substrate and said 2nd substrate through said sealant so that said the 1st current carrying part and 2nd current carrying part may counter inside mutually After said substrate lamination process of the 2nd lengthening about and performing said vertical flow between the substrates of said pair in a current carrying part, It is characterized by having the mounting process which mounts said electronic parts on the external surface of said 1st substrate, and said 1st [the] lengthens about, and a current carrying part and/or said 2nd [the] lengthen about, and is electrically connected with a current carrying part.

[0018] By the manufacture approach of the liquid crystal equipment of this invention, the electronic parts electrically connected to the external surface side of the 1st substrate with the 1st current carrying part of the 1st substrate inside and the 2nd current carrying part of the 2nd substrate inside are mounted. "The 1st current carrying part" and the "2nd current carrying part" which are said here specifically point out the thing of wiring of the scanning line in electrodes, such as a scan electrode in passive matrix mold liquid crystal equipment, and a signal electrode, or active matrix liquid crystal equipment, the data line, etc. Moreover, "electronic parts" points out things, such as IC for a drive, a capacitor, etc. which are specifically used for the drive circuit of liquid crystal equipment.

[0019] In the detail, the 1st in which the 1st current carrying part was prepared covering the external surface of the 1st substrate through the interior of a substrate from the inside of the 1st substrate lengthened about, and it has connected with electronic parts electrically through a current carrying part. On the other hand, the 2nd which crossed between substrates from the inside of the 2nd substrate, and was further prepared in the inside of the 1st substrate covering the external surface of the 1st substrate through the interior of a substrate from the inside of the 1st substrate lengthened the 2nd current carrying part about, and it has connected with electronic parts electrically through a current carrying part.

[0020] Therefore, if it says with the configuration of conventional liquid crystal equipment, to lengthening about and wiring being drawn about by the field (non-display field) of the outside of the electrode formation field on the inside of the 1st substrate (if it puts in another way viewing area), with the liquid-crystal equipment manufactured by the manufacture approach of this invention, it will lengthen about and a current carrying part (it lengthens about and wires) will be lengthened about through the interior of a substrate at an external-surface side from the inside side of the 1st substrate.

[0021] therefore, according to the configuration of the liquid crystal equipment manufactured by the manufacture approach of this invention, in the configuration of conventional liquid crystal equipment, it had prepared in the viewing-area outside of the 1st substrate inside -- since it lengthens about and a field becomes unnecessary, only the part can narrow a frame part sharply compared with the former. Moreover, since it lengthens about all over the external surface side of the 1st substrate including the inside of a viewing area, and a current carrying part can be arranged, it lengthens about and the pitch between current carrying parts can be designed with allowances, the problem that lengthen about and resistance increases does not arise. Moreover, it can lengthen about in this way, generating of a cross talk can be improved by low resistance-ization of a current carrying part, and display grace can be improved.

[0022] Moreover, since it lengthens about as mentioned above and a current carrying part can be arranged all over the external surface side of the 1st substrate even if it lengthens about with the increment in display capacity and makes [many] the number of a current carrying part (it lengthens about and wires) Compared with the conventional liquid crystal equipment which lengthened about and had established the field in the viewing-area outside of the 1st substrate inside, it lengthens about, and the line breadth and the pitch of a current carrying part can be designed with allowances, and it lengthens about, and is hard to generate defects, such as an open circuit of a current carrying part.

[0023] Moreover, in mounting electronic parts in the external surface side of the 1st substrate in the manufacture approach of this invention, while constitutes liquid crystal equipment itself, and the 1st

substrate of the liquid crystal equipment obtained by this manufacture approach functions also as a loading substrate of a drive circuit at the same time it functions as a substrate. Therefore, depending on the case, reduction of components for connection, such as a flexible tape, can also be aimed at, and the miniaturization of the cost cut by reduction of the number of components and liquid crystal equipment is still more possible. Moreover, since the liquid crystal equipment with which electronic parts were mounted in the external surface side of the 1st substrate can also be obtained and FPC connected with electronic parts or this an end face and around the 1st which counters, and the 2nd substrate is not attached, in case it attaches in electronic equipment compared with what was made to jut out a substrate more greatly than the substrate of another side, and carried out COF mounting and the thing which carried out COG mounting like the conventional liquid crystal display, it is easy to deal with it.

[0024] Furthermore, since the 1st and the 2nd substrate with which it lengthened about with each current carrying part, and the current carrying part was formed are stuck through a sealant by the manufacture approach of this invention before mounting electronic parts in the external surface side of the 1st substrate If it is made to mount electronic parts only in what the 1st, the 1st of the 2nd substrate, and the 2nd lengthened about, connected the panel inspection machine with the current carrying part, evaluated the quality of a panel property, and passed before the mounting process of electronic parts, it can be managed even if it does not mount electronic parts in a defect's liquid crystal panel, and reduction of cost is possible.

[0025] Moreover, since the liquid crystal equipment manufactured by this invention as mentioned above can be miniaturized as mentioned above, a miniaturization and low-pricing of electronic equipment are realizable.

[0026] The 2nd of this invention lengthens about and the 2nd formed in external surface opposite to said inside through the interior of a substrate from the inside of said 1st substrate, having applied lengthens a current carrying part about. In addition, the 1st part of a current carrying part, Between substrates is crossed from the inside of the 2nd substrate, the 2nd formed having applied to the inside of the 1st substrate lengthens about, it consists of the 2nd part of a current carrying part, and the 2nd lengthens about. The concrete configuration of a current carrying part The 2nd lengthens about and the 2nd part of a current carrying part consists of connections between substrates which were prepared between the 1st substrate and the 2nd substrate and were electrically connected with the 2nd current carrying part. the 2nd hole which the 2nd lengthened about, and the 1st part of a current carrying part was prepared in the interior of a hole prepared between the inside side of the 1st substrate, and the external surface side, and was electrically connected with the connection between said substrates -- with an inside connection the external surface top of said 1st substrate -- setting -- the 2nd hole -- it can consider as the configuration which has the 2nd external surface top connection which connects an inside connection and electronic parts electrically.

[0027] The 1st in the 1st substrate lengthens about. Moreover, the concrete configuration of a current carrying part the 1st hole which was prepared in the interior of a hole prepared between the inside side of the 1st substrate, and the external surface side, and was electrically connected with the 1st current carrying part -- the inside connection and external surface top of the 1st substrate -- setting -- the 1st hole -- it can consider as the configuration which has the 1st external surface top connection which connects an inside connection and electronic parts electrically.

[0028] Moreover, the manufacture approach of the liquid-crystal equipment of this invention can also be applied when manufacturing high-reflective-liquid-crystal equipment by preparing the light reflex section in the inside side of said 1st substrate further, and forming a polarization means in the external surface side of said 2nd substrate, and even if it forms wiring in the field which is superficially equivalent to a viewing area after lengthening about in that case and lengthening a current carrying part about to a 1st substrate external surface side, it is convenient in any way on a display. Moreover, the electronic parts electrically connected to these wiring can also be arranged in the field which is equivalent to the viewing area of the 1st substrate external surface similarly. And the liquid crystal equipment manufactured by the manufacture approach of this invention lengthens about, and the basic configuration of a current carrying part is the same also about the 2nd drawer current carrying part from the 2nd substrate which the 1st on the 1st substrate which is the near substrate with which electronic parts were mounted lengthens about, and confronts each other not

only on both sides of a current carrying part but on both sides of a liquid crystal layer. That is, it has all composition of the substrate of a pair that it lengthens about, and a current carrying part is finally lengthened about through the interior of the 1st substrate at the external surface side of the 1st substrate, and is connected to electronic parts.
[0029] Moreover, the manufacture approach of the liquid crystal equipment of this invention is constituted from an electrical conducting material which the 1st and the 2nd lengthen about and has translucency as [both] a current carrying part. It can also apply, when manufacturing transparency mold liquid crystal equipment by furthermore forming a polarization means in the external surface [of said 1st substrate], and external surface side of said 2nd substrate, respectively. In that case, if this is arranged in a viewing area after lengthening about and lengthening a current carrying part about to a substrate external surface side, it will be convenient in any way on a display. That is, if all the substrates of a pair lengthen about, a current carrying part lengthens about to the external surface side of the 1st substrate through the interior of the 1st substrate and COF mounting is performed as opposed to the external surface of the 1st substrate, a signal can be supplied from one IC for a drive on COF to all the 1st and 2nd current carrying part.
[0030] As a method of the liquid crystal equipment which can be manufactured by the manufacture approach of the liquid crystal equipment of this invention, passive matrix mold liquid crystal equipment, the active matrix liquid crystal equipment which used the thin-film diode (it is written as TFD ThinFilm Diode and the following) for the switching element, the active matrix liquid crystal equipment which used the thin film transistor (it is written as TFT Thin Film Transistor and the following) for the switching element are mentioned, for example.
[0031] Moreover, it is desirable for the 1st to lengthen about at least on the external surface of said 2nd substrate and 1st substrate in front of lamination, and for the 2nd to lengthen about to the liquid crystal equipment of this invention with a current carrying part in the manufacture approach, and to equip it with the process which forms the 1st protective layer of a wrap in a current carrying part.
[0032] If it has the formation process of such 1st protective layer, in case the 1st and the 2nd substrate will be stuck through a sealant Usually, on a surface plate, since it is unifying putting the pressure after arrangement, the 1st and the 2nd substrate which were made to counter through a sealant If the 1st above protective layer is formed at this time, the 1st by the side of the external surface of the 1st substrate lengthens about, and the 2nd lengthens about with a current carrying part, and a blemish will not be attached to a current carrying part, or it will not be polluted. Since poor contact can be prevented and this 1st protective layer can serve also as an insulation further, the short-circuit by adhesion of conductive dust etc. can be prevented. Moreover, when forming the orientation film etc. in the inside side of the case where the 1st by the side of external surface lengthens about the 1st current carrying part by the side of the inside of the 1st substrate, a current carrying part and the 2nd lengthen about, and it forms after the 1st partial formation of a current carrying part, or the 1st substrate It can prevent that the 1st by the side of the external surface of the 1st substrate lengthens about with drug solutions, such as an organic solvent used with formation processes, such as a patterning process of the 1st current carrying part, and orientation, the 2nd lengthens about with a current carrying part, and a current carrying part corrodes. Moreover, since this 1st protective layer can serve also as an insulation as described above, it is easy to deal with it and easy to include it in electronic equipment.
[0033] Moreover, although the external surface side of the 1st substrate has irregularity only by the 1st lengthening about, a current carrying part and the 2nd lengthening about, and the 1st part of a current carrying part being formed in the external surface side of the 1st substrate When the substrate which has flexibility as the 1st substrate especially is used, irregularity arises in an inside side with the irregularity produced in the external surface side by the difference in the coefficient of thermal expansion of a substrate and a current carrying part when heat started this 1st substrate at a substrate lamination process etc. Dispersion arises at spacing between substrates by this, and there is a possibility that display quality may be affected. on the other hand, in forming said 1st protective layer all over the external surface side of the 1st substrate Since flattening of the external surface side of the 1st substrate can be carried out, when the substrate which has flexibility as the 1st substrate especially is used Even if heat starts this 1st substrate at a substrate lamination process etc., it can prevent that irregularity arises in the external surface side of the 1st substrate, it can prevent

that dispersion arises at spacing between substrates, and cel thickness is made to homogeneity and the display quality of the liquid crystal equipment obtained can be improved.
[0034] Moreover, when forming said 1st protective layer all over the external surface side of the 1st substrate and the usual surface plate with a flat front face can be used in case the 1st and the 2nd substrate are arranged on a surface plate and it unifies since the external surface of the 1st substrate can be made flat, a pressure can be equally put on the substrate of the 1st and the 2nd **, and the quality of the liquid crystal equipment obtained can be improved.
[0035] Moreover, it is desirable to have the process which exfoliates said 1st protective layer partially before the mounting process of said electronic parts.
[0036] If it has the partial exfoliation process of such 1st protective layer, the 1st linked to electronic parts lengthens about, the 2nd can lengthen about the terminal area top of a current carrying part, the 1st protective layer on the terminal area of a current carrying part can be exfoliated partially, and a terminal area can be exposed. Since the 1st other than these terminal areas moreover lengthens about, a current carrying part and the 2nd lengthen about that what is necessary is for this 1st [the] exposed and the 2nd to lengthen electronic parts about, and just to connect them with each terminal area of a current carrying part and the current carrying part is covered by the 1st protective layer, a blemish can be attached or it can prevent that conductive dust etc. adheres. Moreover, at the partial avulsion process of this 1st protective layer, in order to connect with a panel inspection machine and to investigate the property (property of a panel) of the 1st and the 2nd substrate, the 1st linked to electronic parts and the 2nd lengthen about, and the 1st protective layer other than on [of a current carrying part] a terminal area may also exfoliate partially.
[0037] Moreover, it is desirable to have the inspection process of the 1st and the 2nd substrate which were stuck at said substrate lamination process between the partial exfoliation process of said said 1st protective layer and the mounting process of said electronic parts.
[0038] If it has the inspection process of such the 1st and the 2nd substrate and is [the 1st partially exposed in the partial avulsion process of the 1st protective layer and the 2nd lengthen about, a panel inspection machine is connected with a current carrying part, the quality of a panel property is evaluated and] made to mount electronic parts only in what passed, it can be managed even if it does not mount electronic parts in a defect's panel, and reduction of cost is possible.
[0039] Moreover, you may make it embed said some of electronic parts [at least] in the mounting process of said electronic parts in the crevice beforehand formed in said 1st substrate. In that case, as the quality of the material of the 1st substrate used, a glass substrate and a glass strengthening plastic plate are used suitably.
[0040] It is desirable to have the process which said electronic parts, the 1st, and the 2nd lengthen about, and forms the 2nd protective layer of a wrap for a connection with a current carrying part at least after the mounting process of said electronic parts further again at the external surface side of the 1st substrate. Since a blemish can be attached to this connection or it can prevent being polluted, since the 1st by the side of the external surface of the 1st substrate of liquid crystal equipment and the 2nd lengthen about and a current carrying part and the connection of electronic parts can protect by the 2nd protective layer, if it has the process which forms such 2nd protective layer, and this 2nd protective layer can serve also as an insulation, it is easy to deal with it and easy to include in electronic equipment. Moreover, since it can carry out flattening of the external surface side of the 1st substrate in forming the 2nd protective layer all over the external surface side of the 1st substrate, it becomes easier to deal with it.
[0041] By the manufacture approach of this invention, the substrate which has flexibility as said the 1st substrate and/or said 2nd substrate may be used. If the substrate which has flexibility as the 1st and 2nd substrates is used, an advantage, like a curved-surface display is attained by incurvating the substrate which breakage of the crack of a substrate which can attain thin-shape-izing of the liquid crystal equipment obtained by this manufacture approach and lightweight-ization stops being able to produce easily is acquired, and the suitable liquid crystal equipment for electronic equipment, such as a pocket device, can be manufactured. Moreover, a through hole can be easily formed by operating laser beam machining, chemical etching, etc. to this 1st substrate as the 1st substrate is a substrate which has flexibility. Furthermore, by performing restoration of a silver paste into this through hole etc., electrolytic plating, etc., in a through hole, the 1st which consists of a conductive

ingredient lengthens about, and a part of current carrying part (the 1st hole inside connection) and a part of 1st part (the 2nd hole inside connection) of the 2nd leading-about current carrying part can be formed.

[0042] On the other hand, the 1st external surface top connection and the 2nd external surface top connection can be easily formed with the usual wiring formation techniques, such as membrane formation of the electric conduction film, and patterning, and the connection between substrates can be prepared by the approach of mixing electric conduction material in a sealant.

[0043] The 1st current carrying part and the 1st external surface top connection are electrically connectable through an inside connection. therefore, said approach -- the 1st hole -- forming an inside connection -- this 1st hole -- the aforementioned approach -- the 2nd hole -- forming an inside connection -- this 2nd hole, since the 2nd current carrying part and the 2nd external surface top connection are electrically connectable through an inside connection and the connection between substrates Lengthen about, and a current carrying part can lengthen about to the external surface side of the 1st substrate through the interior of the 1st substrate, and further by all the things of the 1st and the 2nd substrate for which electronic parts are mounted in the external surface side of this 1st substrate While while constitutes liquid crystal equipment itself and the 1st substrate is operated as a substrate, it can be made to function also as a loading substrate of a drive circuit.

[0044] Moreover, as the 1st substrate, the 1st current carrying part by the side of an inside, the substrate which the 1st by the side of external surface lengthens about, and has the internal current carrying part (internal conductive layer) of one or more layers inside a substrate besides a current carrying part (1st external surface top connection), and a substrate like the so-called multilayer printed circuit board may be used. In this case, the hole ranging from the inside to external surface of the 1st substrate consists of two or more beer halls prepared between the external surface of the 1st substrate, and an internal current carrying part, or between mutual internal current carrying parts between the inside of the 1st substrate, and an internal current carrying part.

[0045] Since will lengthen about, for example and the number of current carrying parts will increase, if this kind of substrate is used, a part lengthens about when it becomes difficult for a large number to lengthen about and to arrange a current carrying part only on the external surface of the 1st substrate, a current carrying part can be lengthened also about using an internal current carrying part and the degree of freedom of length **** improves, it becomes possible to correspond to manufacture of the liquid crystal equipment which increased display capacity.

[0046] Moreover, in a configuration of the 1st by the side of external surface lengthening about, and having a current carrying part (1st external surface top connection) as the 1st substrate, what the 1st current-carrying-part [by the side of an inside] and external surface side lengthened about, and constituted the current carrying part (1st external surface top connection) from same conductive ingredient may be used.

[0047] Since photolithography and etching can be performed to both sides by the side of an inside and external surface, patterning of the double-sided electric conduction film can be carried out to coincidence and the 1st current carrying part and the 1st external surface top connection can be formed after forming the electric conduction film to an inside [of the 1st substrate], and external surface side if it is made this configuration, simplification of a production process can be attained.

[0048] Moreover, what was constituted from a conductive ingredient which the 1st by the side of the 1st current carrying part by the side of an inside and external surface lengthens about, and is different in a current carrying part (1st external surface top connection) as the 1st substrate conversely can also be used.

[0049] When the electrode in the 1st current carrying part, for example, passive matrix mold liquid crystal equipment, serves as the light reflex section in this configuration so that it may mention later, As it lengthens about to the 1st current carrying part and metallic materials, such as copper which is low electrical resistance materials, are used for the 1st external surface top connection at it using metallic materials, such as silver with the high rate of a light reflex (or alloy containing silver), and aluminum, for resistance reduction the 1st current carrying part and the optimal electrical conducting material for the 1st function of each external surface top connection can be chosen. Consequently, the aforementioned advantage of simplification of a production process can raise the display quality of the liquid crystal equipment obtained instead of not being obtained.

[0050] Moreover, in the manufacture approach of the liquid crystal equipment of this invention, in the mounting process of said electronic parts, it is on the external surface of the 1st substrate, and it is desirable to mount said electronic parts in the part corresponding to a non-display field. A "non-display field" here points out the thing of the field of the outside of the electrode formation field (if it puts in another way viewing area) of the 1st substrate, the field outside the sealant formation location between the 1st and 2nd substrate (the same location as a sealant is also included), or the field outside the location which went into the liquid crystal layer side more slightly than said sealant.
[0051] Although a viewing area will become small compared with the case where it mounts in a viewing area if the mounting position of electronic parts is a non-display field although heat may start the 1st substrate locally in case electronic parts are mounted in the external surface side of the 1st substrate, it can avoid having a bad influence on a viewing area with the heat at the time of mounting, and the effectiveness of preventing generating of display nonuniformity etc. is excellent. Moreover, if the mounting position of electronic parts is a non-display field although irregularity may arise in the 1st substrate with the heat at the time of mounting of electronic parts when the 1st substrate is a substrate which has flexibility, it can avoid that said irregularity has a bad influence on a display, and display quality can be maintained.
[0052] Moreover, in the manufacture approach of the liquid crystal equipment of this invention, it is desirable to use that by which the external connection terminal electrically connected with the input terminal of electronic parts, such as said IC for a drive, was prepared in the external surface side periphery section as said 1st substrate in said substrate lamination process. If such an external connection terminal is prepared in the external surface side periphery section of the 1st substrate, when it mounts FPC for supplying a driving signal etc. in IC for a drive further, alignment at the time of joining an external connection terminal and the terminal of FPC can be performed easily. Moreover, although stress may occur in a part for a joint the time of FPC junction, or after junction, if the location is the substrate periphery section from which it separated from the viewing area, said stress will not have a bad influence on a display.
[0053] Moreover, in the manufacture approach of the liquid crystal equipment of this invention, it is desirable to use that in which the external connection terminal which said 1st [the] lengthened about in the external surface side periphery section as said 1st substrate in said substrate lamination process, and a current carrying part and said 2nd [the] lengthened about, and was electrically connected with the current carrying part was prepared. If such an external connection terminal is prepared in the external surface side periphery section of the 1st substrate, when it mounts COF etc., alignment at the time of joining an external connection terminal and the terminal of COF can be performed easily. Moreover, although stress may occur in a part for a joint the time of COF junction, or after junction, if the location is the substrate periphery section from which it separated from the viewing area, said stress will not have a bad influence on a display.
[0054] In order to attain the aforementioned purpose, moreover, the liquid crystal equipment of this invention While the 1st current carrying part is prepared on the inside which is liquid crystal equipment with which the liquid crystal layer was pinched between the substrates of the pair by which opposite arrangement was carried out mutually, and faces said liquid crystal layer in the 1st substrate among the substrates of said pair The 1st electrically connected with this 1st current carrying part lengthens about, and a current carrying part is prepared covering said inside and external surface of the opposite side through the interior of a substrate from said inside. While the 2nd current carrying part is prepared on the inside which faces said liquid crystal layer in the 2nd substrate which has translucency The 2nd electrically connected with this 2nd current carrying part lengthens about. A current carrying part to the inside of said 1st substrate, from the inside of said 2nd substrate Furthermore, it is prepared covering the external surface of the 1st substrate through the interior of a substrate from the inside of the 1st substrate. The electronic parts which said 1st [the] lengthened about to the way or external surface side outside said 1st substrate, and a current carrying part and said 2nd [the] lengthened about, and were electrically connected with the current carrying part are mounted. It is characterized by for the 1st having lengthened about at least to the external surface side of said 1st substrate, and for the 2nd having lengthened about with the current carrying part, and preparing a current carrying part in the 1st protective layer of a wrap.
[0055] Since according to the configuration of the liquid crystal equipment of this invention it

lengthens about all over the external surface side of the 1st substrate including the inside of a viewing area, and a current carrying part can be arranged, it lengthens about and the pitch between current carrying parts can be designed with allowances, Even if it lengthens about with the increment in display capacity and makes [many] the number of a current carrying part, without the problem that lengthen about and resistance increases arising, it lengthens about, and the line breadth and the pitch of a current carrying part can be designed with allowances, and it lengthens about, and is hard to generate defects, such as an open circuit of a current carrying part. Moreover, it can lengthen about in this way, generating of a cross talk can be improved by low resistance-ization of a current carrying part, and display grace can be improved.

[0056] Moreover, since the 1st and the 2nd lengthen about at least to the external surface side of the 1st substrate and the 1st protective layer of a wrap is formed in the current carrying part Since the 1st by the side of the external surface of the 1st substrate lengthens about, the 2nd can lengthen about with a current carrying part, it is not polluted, poor contact can be prevented [a blemish can be attached to a current carrying part, or] and said protective layer can serve also as an insulation further The short-circuit by adhesion of conductive dust etc. can be prevented, and it is easy to deal with it, and easy to include in electronic equipment. Moreover, since flattening of the external surface side of the 1st substrate can be carried out when the 1st protective layer is formed all over the external surface side of the 1st substrate, it becomes easier to deal with it.

[0057] As for the electronic parts mounted in the external surface side of said 1st substrate, at least the part may be embedded at said 1st substrate.

[0058] It is desirable for said electronic parts, the 1st, and the 2nd to lengthen about at least to the external surface side of the 1st substrate with which said electronic parts were mounted, and to prepare the connection with a current carrying part in the 2nd protective layer of a wrap.

[0059] Since a blemish can be attached to this connection or it can prevent being polluted, since according to this configuration the 1st by the side of the external surface of the 1st substrate of liquid crystal equipment and the 2nd lengthen about and the current carrying part and the connection of electronic parts are protected by the 2nd protective layer, and this 2nd protective layer can serve also as an insulation, it is easy to deal with it and easy to include in electronic equipment. Moreover, since flattening of the external surface side of the 1st substrate is carried out when the 2nd protective layer is formed all over the external surface side of the 1st substrate, it becomes easier to deal with it.

[0060] Said the 1st substrate and/or said 2nd substrate may consist of substrates which have flexibility.

[0061] If it is made this configuration An advantage, like a curved-surface display is attained by incurvating the substrate which breakage of the crack of a substrate which can attain thin-shape-izing of liquid crystal equipment and lightweight-ization stops being able to produce easily is acquired, and it becomes a suitable thing for electronic equipment, such as a pocket device.

[0062] It is on the external surface of said 1st substrate, and it is desirable to mount said electronic parts in the part corresponding to a non-display field.

[0063] Although a viewing area will become small compared with the case where said electronic parts are mounted in a viewing area if it is made this configuration, it can avoid having a bad influence on a viewing area with the heat at the time of mounting, and the prevention effectiveness of generating, such as display nonuniformity, is excellent. Moreover, since the mounting position of electronic parts is a non-display field although irregularity may arise in the 1st substrate with the heat at the time of mounting of electronic parts when the 1st substrate is a substrate which has flexibility, it can avoid that said irregularity has a bad influence on a display, and display quality can be maintained.

[0064] The electronic equipment of this invention is characterized by having liquid crystal equipment of this invention of one of the aforementioned configurations. According to the electronic equipment of this invention, by having had small liquid crystal equipment by narrow-picture-frame-izing, a viewing area is comparatively large and electronic equipment excellent in portability with the whole small equipment can be realized.

[0065]

[Embodiment of the Invention] The liquid crystal equipment obtained with the gestalt of

implementation of the 1st of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 1 - drawing 13 below [the gestalt of the 1st operation].

[0066] The gestalt of this operation is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of a passive matrix mold liquid crystal display, and is the example of manufacture of the liquid crystal display which has the display electrode which served as the light reflex section, and the so-called reflector.

[0067] The perspective view which looked at the whole liquid crystal display with which drawing 1 was obtained with the gestalt of this operation from the top-face side, The perspective view and drawing 3 which looked at drawing 2 from the inferior-surface-of-tongue side The top-face (electrode forming face) Fig. of a bottom substrate, The transparency top view where drawing 4 looked at the bottom substrate from the inferior-surface-of-tongue side (transparency top view seen from the component-side side of electronic parts), The transparency top view showing the condition that drawing 5 piled up the inferior-surface-of-tongue (electrode forming face) Fig. of a top substrate, and drawing 6 piled up the top substrate and the bottom substrate, the sectional view where drawing 7 meets the A-A' line of drawing 6 , and drawing 8 are sectional views which meet the B-B' line of drawing 6 . In addition, in all the following drawings, in order to make each class and each part material into the magnitude of extent which can be recognized on a drawing, the scale is changed for each class or every each part material.

[0068] As the liquid crystal display 1 obtained by the manufacture approach of the gestalt this operation is shown in drawing 1 , opposite arrangement of the bottom substrate 2 (the 1st substrate) and the top substrate 3 (the 2nd substrate) is carried out, and the liquid crystal layer (drawing 1 illustration abbreviation) is pinched among these substrates. With the gestalt of this operation, the opaque substrate which consists of polyimide etc. as a bottom substrate 2 is used, and the transparence substrate which consists of a polycarbonate, polyether sulphone, acrylic resin, etc. as a top substrate 3 is used. In the following explanation, an "inside" and the field of it and the opposite side are called "external surface" for the near field facing the liquid crystal layer of both substrates. That is, an "inside" and the field of it and the opposite side are called "external surface" for the near field where a liquid crystal layer is arranged in both substrates. Moreover, sequential attachment of the phase contrast plate 4 (lambda/4 plate) and the polarizing plate 5 (polarization means) is carried out at the external surface side of the top substrate 3. In addition, in the drawing after drawing 2 , illustration of the phase contrast plate 4 and a polarizing plate 5 is omitted.

[0069] On the inside of the bottom substrate 2, many signal electrodes 6 (the 1st current carrying part) are formed in the shape of a stripe, and the scan electrode 7 (the 2nd current carrying part) of a large number which extend in the direction which intersects perpendicularly with a signal electrode 6 is formed in the shape of a stripe on the inside of it and the top substrate 3 which counters. And the part which a signal electrode 6 and the scan electrode 7 intersect serves as each pixel 8, and the field which many pixels 8 arranged in the shape of a matrix turns into a viewing area 9. In addition, although a signal electrode and the electrode by the side of the top substrate 3 are explained as a scan electrode, even if this is reverse, it does not care about the electrode by the side of the bottom substrate 2 with the gestalt of this operation at all.

[0070] As shown in drawing 2 , in the external surface top of the bottom substrate 2, IC10 (electronic parts) for a drive is superficially mounted in the field corresponding to a viewing area 9. This IC10 for a drive supplies a scan signal for a picture signal to the scan electrode 7 to a signal electrode 6 in response to the signal inputted through the external connection terminal 26 from the external circuit (not shown). Moreover, the connection wiring 12 (1st external surface top connection) for signal electrodes which is later mentioned on the external surface of the bottom substrate 2 and which object[for signal electrodes]-****** and constitutes some wiring (the 1st lengthening about current carrying part), And the connection wiring 14 (2nd external surface top connection) for scan electrodes which object[for scan electrodes]-****** and constitutes a part of 1st part of wiring (the 2nd lengthening about current carrying part) is arranged, respectively, and is electrically connected with the terminal of IC10 (drawing 2 and drawing 4 are an illustration abbreviation) for a drive.

[0071] As shown in drawing 3 , many signal electrodes 6 which consist of a metal thin film with high rates of a light reflex, such as aluminum and silver (or alloy containing silver), are formed in the

shape of a stripe (band-like) on the inside of the bottom substrate 2. These signal electrodes 6 serve as the reflecting layer, and it carries out incidence from a way outside the top substrate 3 through a polarizing plate 5 and the phase contrast plate 4 at the time of a display, and the light which penetrated the liquid crystal layer reaches the inside of the bottom substrate 2, they are reflected on the front face of these signal electrodes 6, and image display is made. the hole which the end of a signal electrode 6 is thinly prolonged in the extension direction of an electrode as it is, and the tip is circularly formed, and is mentioned later -- it is the land 16 for connecting with an inside connection (the 1st hole inside connection). The land 16 is arranged at the edge along the substrate side of the extension direction of a signal electrode 6 in the bottom substrate 2. The through hole which penetrates between the inside of the bottom substrate 2 and external surface is formed in the center of a land 16. This part of the edge of a signal electrode 6 serves as the connection wiring 18 for signal electrodes which connects electrically a signal electrode 6 and IC10 for a drive and which object[for signal electrodes]-****** and constitutes some wiring.

[0072] Since the connection wiring 18 for signal electrodes is pulled out by the field of the opposite side by turns sequentially from the signal electrode 6 of the topmost part in drawing 3 like the left-hand side of a signal electrode 6, right-hand side, left-hand side, and -- in the case of the gestalt of this operation, dependability is secured that spacing during connection wiring which adjoins in the vertical direction is large, and it is hard to short-circuit connection wiring. However, if there is no problem in spacing during connection wiring etc. especially, it is arbitrary to pull out all connection wiring in this direction, or to divide connection wiring of left-hand side and bottom one half with right-hand side, and to pull out connection wiring of for example, top one half etc., and the direction of a drawer of connection wiring is good to pull out etc. Moreover, correspondence also in a ** pitch is attained by arranging to JIGUZAKU (staggered arrangement) rather than arranging a through hole linearly. Furthermore, even if it does not make the part thinner than a signal electrode 6 especially as connection wiring, the configuration of having only established the through hole in the edge of a signal electrode 6 may be used.

[0073] Moreover, much connection wiring 21 (2nd inside top connection) for scan electrodes which connects electrically between the vertical flow section (connection between substrates) mentioned later and the connections in a hole (the 2nd hole inside connection) is formed in the edge of one [which adjoins the substrate side where the land 16 has been arranged at the end in the bottom substrate 2] of other substrate sides. The connection wiring 21 for these scan electrodes is electrically connected with each scan electrode 7 of the top substrate 3 on a land 22 by the vertical flow between vertical substrates. In the case of the gestalt of this operation, the land 22 of the rectangle to which the end of each connection wiring 21 for scan electrodes touches the vertical flow section, and the other end serve as the circular land 23 which touches the connection in a hole, and the through hole which penetrates between the inside of the bottom substrate 2 and external surface is formed in the center of the circular land 23. The connection wiring 21 for these scan electrodes is also formed with ingredients, such as the same aluminum as a signal electrode 6.

[0074] Drawing 4 shows the condition of having turned over the bottom substrate 2 shown in drawing 3 . On the external surface of the bottom substrate 2, the circular lands 24 and 25 are formed corresponding to the location of the through hole formed into the land 16 of the connection wiring 18 for signal electrodes shown in drawing 3 , and the through hole formed into the land 23 of the connection wiring 21 for scan electrodes, respectively. Furthermore, on the external surface of the bottom substrate 2, the connection wiring 12 for signal electrodes is formed towards the mounting field of IC10 for a drive, respectively from each land 24 corresponding to the through hole formed into the land 16 of the connection wiring 18 for signal electrodes. The connection wiring 14 for scan electrodes is formed towards the mounting field of IC10 for a drive from each land 25 corresponding to the through hole similarly formed into the land 23 of the connection wiring 21 for scan electrodes.

[0075] Along with three sides (three substrate sides), the lands 24 and 25 of said large number are arranged among four sides (four substrate sides) of the periphery section of the bottom substrate 2. Many external connection terminals 26 are formed along with the substrate side (substrate side where a land 25 is arranged) where electrical installation (vertical flow) with the scan electrode 7 formed in the inside of the top substrate 3 is made, and the one remaining sides which counter. That

is, array formation of the external connection terminal 26 formed on the external surface of the bottom substrate 2 is carried out at the end along the substrate side of the bottom substrate 2 located in the extension direction of the scan electrode 7 formed in the inside of the top substrate 3. In case the external connection terminal 26 connects the external circuit for a drive etc. with this liquid crystal display 1 using components for connection, such as FPC and an anisotropy electric conduction connector (or rubber connector), it is a terminal for connecting with the terminal of that FPC. And the wiring 41 for a signal input for supplying a driving signal to IC10 for a drive towards the mounting field of IC10 for a drive from each of these external connection terminal 26 is formed, respectively. In the case of the gestalt of this operation , all of the connection wiring 12 for signal electrodes formed in the external surface of the bottom substrate 2 , the connection wiring 14 for scan electrodes , the external connection terminal 26 , and the wiring 41 grade for a signal input be form from ingredients , such as aluminum and silver (or alloy containing silver) , as well as the signal electrode 6 by the side of an inside , each connection wiring 18 , and 21 grades . That is, wiring of those other than scan electrode 7 formed in the inside of the top substrate 3 and an electrode are formed from the same ingredient.

[0076] in addition, the field shown in the external surface of the bottom substrate 2 with the two-dot chain line of drawing 2 and drawing 4 -- that is Remove the connection field of IC10 for a drive, and the formation field of the external connection terminal 26. The 1st protective layer 82 which consists the field which wiring exposed of resin, such as polyimide and a resist, is formed. It is desirable to cover the connection wiring 12 (1st external surface top connection) for signal electrodes and the connection wiring 14 (2nd external surface top connection) for scan electrodes, and the wiring 41 grade for a signal input with this 1st protective layer 82. If such 1st protective layer 82 is formed, since faults, such as corrosion of the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, and wiring of the wiring 41 grade for a signal input, an open circuit, and short-circuit, can be prevented and flattening of the external surface side of the bottom substrate 2 can be carried out, it becomes easy to deal with it.

[0077] As shown in drawing 5 , many scan electrodes 7 which consist of transparent conductive thin films, such as ITO, are formed in the shape of a stripe (band-like) on the inside of the top substrate 3. The edge of the die-length direction (the wiring formation direction) of each scan electrode 7 in drawing 5 serves as a part connected to the vertical flow section. In addition, the external surface side of the top substrate 3 which is not illustrated serves as a flat field which is not formed at all.

[0078] When the bottom substrate 2 and the top substrate 3 of the above-mentioned configuration are piled up, it comes to be shown in drawing 6 . In drawing 6 , the member of a sign 27 shown according to the two-dot chain line is a sealant for closing a liquid crystal layer between substrates while pasting up both substrates. The part which a signal electrode 6 and the scan electrode 7 intersect serves as each pixel 8, and the field which many pixels 8 arranged in the shape of a matrix turns into a viewing area 9. In the case of the gestalt of this operation, the appearance of the **** [appearance / of the bottom substrate 2] substrate 3 is smaller, and the periphery section of the bottom substrate 2 is protruded into the outside of the top substrate 3. The part of the land 16 at the tip of each connection wiring 18 for signal electrodes on the inside of the bottom substrate 2 is overflowed and located in the outside of the top substrate 3, respectively. That is, each connection wiring 18 for signal electrodes drawn from each signal electrode 6 runs through the formation section of a sealant, and is further extended and formed outside the appearance (periphery) of the top substrate 3, and the land 16 is arranged at a part for the point. On the other hand, about each connection wiring 21 for scan electrodes on the inside of the bottom substrate 2, the part of the land 22 of the rectangle which touches the vertical flow section is located in the part of a sealant 27, and the part of the circular land 23 in which the through hole was established is overflowed and located in the outside of the top substrate 3.

[0079] Drawing 7 is the sectional view which meets the A-A' line of drawing 6 , i.e., the sectional view cut in the direction which met the signal electrode 6. As shown in this drawing, a sealant 27 is pinched between the bottom substrate 2 and the top substrate 3, and the liquid crystal layer 28 is pinched by the space sealed by the bottom substrate 2, the top substrate 3, and the sealant 27. Here, common liquid crystal, such as for example, STN (Super Twisted Nematic) liquid crystal, can be used as a liquid crystal layer 28.

[0080] While a signal electrode 6 and a signal electrode 6, and the really formed connection wiring 18 for signal electrodes are formed on the inside of the bottom substrate 2, on the external surface of the bottom substrate 2, the connection wiring 12 for signal electrodes is formed, and the through hole 17 which penetrates a substrate is formed in the part of the land at the tip of the connection wiring 12 and 18 for signal electrodes of both sides. the hole to which the interior of a through hole 17 is filled up with conductive ingredients, such as a silver paste, and this conductive ingredient connects electrically the connection wiring 18 for signal electrodes by the side of an inside, and the connection wiring 12 for signal electrodes by the side of external surface -- the inside connection 15 is constituted.

[0081] here, as a more detailed configuration of the connection 15 in a hole, it is shown, for example in drawing 11 (a) -- as -- the interior of a through hole 17 -- conductive ingredients, such as a silver paste, -- embedding -- a hole -- if the front face of a conductive ingredient is covered with insulating resin and an enveloping layer 29 is formed after forming the inside connection 15, the corrosion of a conductive ingredient can be prevented. or it is shown in drawing 11 (b) -- as -- the interior of a through hole 17 -- a conductive ingredient -- embedding -- a hole -- the top face and inferior surface of tongue of the connection 15 in the hole after forming the inside connection 15 previously -- a wrap -- the connection wiring 18 and 12 for signal electrodes may be formed on the inside of the bottom substrate 2, and external surface like, respectively.

[0082] or a hole -- an inside connection just connects electrically connection wiring for signal electrodes by the side of an inside and external surface, and may not necessarily be embedded to the whole interior of a hole. therefore, as shown in drawing 12 , a conductive ingredient is adhered only to the wall of a through hole 17 using electrolysis plating -- making -- a hole -- it is good also as an inside connection 30.

[0083] Moreover, as shown in drawing 7 , the terminal 31 of IC10 for a drive is connected to the edge of the opposite side the side in which the through hole 17 of the connection wiring 12 for signal electrodes formed on the external surface of the bottom substrate 2 was established. the picture signal outputted from IC10 for a drive by taking the above wiring structures -- the connection wiring 12 for signal electrodes on the external surface of the bottom substrate 2, and a hole -- each signal electrode 6 is supplied via the connection wiring 18 for signal electrodes on the inside of the inside connection 15 and the bottom substrate 2. therefore, the connection wiring 12 for signal electrodes on the external surface of these bottom substrate 2 and a hole -- the connection wiring 18 for signal electrodes on the inside of the inside connection 15 and the bottom substrate 2 will object[for signal electrodes]-******, and will constitute wiring 11.

[0084] The mounting gestalt of IC10 for a drive shown in drawing 7 is called the so-called face down mounting (or ILB (Inner Lead Bonding) mounting) which turned the front-face (terminal forming face) side of IC to the substrate side, and the BGA (Ball Grid Array) mold semiconductor device from which the solder ball arranged in the shape of a matrix constitutes a terminal 31, the semiconductor device arranged along with the appearance periphery of IC in the bump electrode are used.

[0085] Or as shown in drawing 10 , the rear-face side of IC32 for a drive may be fixed on the bottom substrate 2, and IC for a drive may be mounted according to the mounting gestalt which carried out bonding of the electrode pad 33 by the side of IC front face, and the connection wiring 12 for signal electrodes with the wire 34 and which is called the so-called face-up mounting (or OLB (Outer Lead Bonding) mounting).

[0086] Moreover, as shown in drawing 7 , many scan electrodes 7 are formed in the inside of the top substrate 3. And the orientation film 35 and 36 is formed in the maximum upper layer which touches the liquid crystal layer 28 of bottom substrate 2 and top substrate 3 both sides, respectively. The orientation film 35 and 36 consists of film, such as polyimide, and orientation processing of rubbing etc. is performed. Moreover, between the bottom substrate 2 and the top substrate 3, the spacer 37 for holding spacing between substrates (henceforth a cel gap) uniformly is sprinkled.

[0087] On the other hand, drawing 8 is the sectional view which meets the B-B' line of drawing 6 , i.e., the sectional view cut in the direction which met the scan electrode 7, it object[for scan electrodes]-****** and the configuration of wiring 13 is shown. As shown in this drawing, the scan electrode 7 is formed on the inside of the top substrate 3 so that it may contact at the top face of a

sealant 27, and the edge of the scan electrode 7. Moreover, on the inside of the bottom substrate 2, while many signal electrodes 6 are formed, the connection wiring 21 for scan electrodes is formed so that the inferior surface of tongue of a sealant 27 may be contacted. Here, electric-conduction material, such as metal particles and a particle which carried out metal plating of the front face of a plastic bowl, is mix in the interior of a sealant 27 into binders, such as resin, the scan electrode 7 and the connection wiring 21 for scan electrodes which contacted, respectively have an anisotropy on the top face and the inferior surface of tongue of a sealant 27, are electrically connect to it, and the vertical flow section (the 2nd lengthen about the connection between substrates, the 2nd part of a current carrying part) 19 constitutes.

[0088] The configuration hereafter connected electrically ranging from the inside to external surface of the bottom substrate 2 is object[for signal electrodes]-******(ed), and is the same as that of the case of wiring 11. That is, the connection wiring 14 for scan electrodes is formed on the external surface of the bottom substrate 2, and the through hole 38 is formed in the part of the lands 23 and 25 at the tip of the connection wiring 21 and 14 for scan electrodes by the side of [both] an inside and external surface. The interior of a through hole 38 was filled up with conductive ingredients, such as a silver paste, and this conductive ingredient constituted the connection 20 in a hole (the 2nd hole an inside connection and the 2nd lengthening about a part of 1st part of a current carrying part), and has connected mutually the connection wiring 21 and 14 for scan electrodes by the side of an inside and external surface electrically.

[0089] Moreover, a through hole 38 is established in the end of the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2, and the terminal 31 of IC10 for a drive is connected to the edge of the opposite side. the scan signal outputted from IC10 for a drive by taking the above wiring structures -- the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2, and a hole -- each scan electrode 7 is supplied via the connection wiring 21 for scan electrodes on the inside of the inside connection 20 and the bottom substrate 2, and the vertical flow section 19. therefore, the connection wiring 14 for scan electrodes on the external surface of these bottom substrate 2 and a hole -- the connection wiring 21 for scan electrodes on the inside of the inside connection 20 and the bottom substrate 2 and the vertical flow section 19 will object[for scan electrodes]-******, and will constitute wiring 13.

[0090] In addition, as it replaces with mixing electric conduction material in the interior of a sealant 27, and making this part into the vertical flow section 19, for example, is shown in drawing 9 The scan electrode 7 is made to extend to the location which hits above the through hole 38 of the bottom substrate 2 of sealant 27 outside on the inside of the top substrate 2. The vertical flow material 39 of arbitration is formed above the through hole 38 of the bottom substrate 2, and it is good also considering this part as the vertical flow section (the 2nd lengthening about the connection between substrates, the 2nd part of a current carrying part) 40. The flow-under besides material 39 can be formed by printing of for example, a silver paste etc. In this configuration, there is no electric flow in the part of a sealant 27, but in the formation part of the vertical flow material 39, the flow between substrates is made and it becomes being almost the same as that of arrangement of drawing 8 , and connection structure as a flow path.

[0091] Hereafter, the gestalt of the 1st operation which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of the passive matrix mold liquid crystal display of the aforementioned configuration is explained.

[0092] A polyimide substrate is prepared as an ingredient of the bottom substrate 2, and the conductive thin film which becomes front flesh-side both sides of a substrate from metallic materials, such as aluminum, is formed. Next, after applying a photosensitive resist on the conductive thin film of substrate both sides, a photo mask is arranged on substrate both sides, and it exposes to coincidence. Subsequently, by performing patterning of the conductive thin film of front flesh-side both sides of a bottom substrate to coincidence using well-known photolithography and an etching technique The signal electrode 6 by the side of above-mentioned bottom substrate 2 inside (the 1st current carrying part), each connection wiring 18 and 21, the connection wiring 12 for signal electrodes by the side of external surface (1st external surface top connection), the connection wiring 14 for scan electrodes (2nd external surface top connection), the wiring 41 for a signal input, and external connection terminal 26 grade are formed collectively.

[0093] Next, the through holes 17 and 38 which penetrate a substrate are formed in the predetermined part of each connection wiring edge on this substrate by irradiating a CO2 laser etc. As other formation approaches of a through hole, chemical etching which used the resist pattern as the mask may be used. then, the interior of through holes 17 and 38 -- conductive ingredients, such as a silver paste, -- being filled up -- a hole -- the inside connections 15 and 20 are formed and it is made to flow through between each connection wiring of bottom substrate 2 both sides electrically moreover, a hole -- the approach of making a conductive ingredient adhering to the wall of a through hole, using electrolytic plating processing etc. as other formation approaches of an inside connection may be used. Anyway, since the signal electrode by the side of bottom substrate 2 inside, etc. various connection wiring by the side of external surface, etc. can be formed in coincidence at 1 time of photolithography, and an etching process by having made the same the conductive thin film material of front flesh-side both sides of a substrate in the case of the gestalt of this operation, a production process can be simplified sharply. The connection wiring 18 for signal electrodes connected to the inside side at a signal electrode 6 and this when done in this way, The connection wiring 21 for scan electrodes is formed, and the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, and the wiring 41 for a signal input are formed in an external surface side. the connection wiring 18 for signal electrodes, and the connection wiring 12 for signal electrodes -- a hole -- it flows electrically through the inside connection 15 -- having -- the connection wiring 21 for scan electrodes, and the connection wiring 14 for scan electrodes -- a hole -- the bottom substrate 2 which flowed electrically through the inside connection 20 is obtained. Then, it is desirable to continue all over the abbreviation for the external surface of the bottom substrate 2, to apply and harden resin, such as polyimide and a resist, to form the 1st protective layer 82, and to protect various connection wiring by the side of external surface.

[0094] On the other hand, transparence substrates, such as a polycarbonate, polyether sulphone, and acrylic resin, are prepared as an ingredient of the top substrate 3, and translucency electric conduction film, such as ITO, is formed to the whole surface (field used as inside) side of a substrate. Subsequently, patterning of the translucency electric conduction film is carried out using well-known photolithography and an etching technique, and the stripe-like scan electrode 7 is formed.

[0095] Next, if orientation processing by the rubbing method etc. is performed and the orientation film 35 and 36 is formed, respectively after applying and calcinating polyimide etc. on the inside of bottom substrate 2 and top substrate 3 both sides, the top substrate 3 as shown in drawing 24 (a), and the bottom substrate 2 as shown in drawing 24 (b) will be obtained. In addition, drawing 24 (a) is the sectional view of the top substrate 3 of a direction which met in the direction which intersects the scan electrode 7. since drawing 24 (b) is the sectional view of the bottom substrate 2 of the direction which met the signal electrode 6 on the other hand -- the connection wiring 14 and 21 for scan electrodes, and a hole -- since it is hiding, the inside connection 20 is not illustrated. When forming the orientation film 35 on the inside of the bottom substrate 2 here, since the connection wiring 12 for signal electrodes formed in the external surface of the bottom substrate 3, the connection wiring 14 for scan electrodes, and the wiring 41 for a signal input are protected by the 1st protective layer 82, a blemish can be attached, or they can prevent that drug solutions, such as an organic solvent, corrode, and can prevent adhesion of conductive dust etc.

[0096] Subsequently, either substrate of the bottom substrate 2 and the top substrate 3 is arranged on a surface plate, the spacer 37 for holding a cel gap on this substrate is sprinkled, after printing the resin ingredient used as a sealant 27, the bottom substrate 2 and the top substrate 3 are piled up and pressurized, lamination and a sealant 27 are stiffened, and an empty cel is produced. In order to make the part of a sealant 27 into the vertical flow section, electric conduction material, such as metal particles, is made to mix into the resin ingredient used as a sealant 27 in the case of the gestalt of this operation. thus -- if it carries out -- a sealant 27 and a hole -- the connection wiring 21 for scan electrodes is electrically connected with the scan electrode 7 through the inside connection 20.

[0097] Since the connection wiring 12 for signal electrodes formed in the external surface of the bottom substrate 3, the connection wiring 14 for scan electrodes, and the wiring 41 for a signal input are protected by the 1st protective layer 82 when sticking substrates 2 and 3 here, a blemish can be attached or it can prevent that conductive dust etc. adheres. Moreover, since flattening of the external

surface side of the bottom substrate 2 is carried out by the 1st protective layer 82, when it requires heat at the lamination process of substrates 2 and 3, it can avoid that irregularity arises in the external surface side of the bottom substrate 2 by the difference in the coefficient of thermal expansion of a substrate 3 and wiring, and it can prevent that dispersion arises at spacing between substrates (cel gap), and cel thickness is made as for it to homogeneity. Moreover, since the external surface side of the bottom substrate 2 is flat in this way, it is easy to put a pressure on the substrates 2 and 3 which were made to counter on the surface of a surface plate, and have been arranged equally.

[0098] Next, liquid crystal is poured in from the liquid crystal inlet of a sealant by the vacuum pouring-in method etc. into an empty cel, and the liquid crystal cell 90 as shown in drawing 24 (c) by closing a liquid crystal inlet is obtained. Among the 1st protective layer 82 formed on the external surface of the bottom substrate 2, then, the part on a connection field with electronic parts 10, The edge (the 1st linked to electronic parts lengthens about, and it is the terminal area of a current carrying part) of the 1st external surface top connection 12 which exfoliates the part formed on the external connection terminal 26, and is in a connection field with electronic parts 10, and the edge of the 2nd external surface top connection 14 (the 2nd linked to electronic parts lengthens about, and it is the terminal area of a current carrying part), The external connection terminal 26 is exposed.

[0099] Moreover, in order to connect with a panel inspection machine and to investigate the property (panel property) of a liquid crystal cell 90, it is desirable for the 1st protective layer 82 other than the aforementioned part to also exfoliate partially, to expose partially wiring (for the exfoliation section here to be illustration abbreviation) etc., to connect a panel inspection machine to these outcrops, to evaluate the quality of a panel property, and to use for a back process only what passed.

[0100] Subsequently, sequential attachment of the phase contrast plate 4 and the polarizing plate 5 is carried out at the external surface side of the top substrate 3 of a liquid crystal cell 90 with which the panel property passed. Then, IC10 for a drive (electronic parts) is mounted in the connection field of the electronic parts formed in the external surface side of the bottom substrate 2 with gestalten, such as face down mounting and face-up mounting. According to the above process, the liquid crystal display 1 of the gestalt of this operation is completed. Here, since a panel property sticks the phase contrast plate 4 and a polarizing plate 5 only on the good liquid crystal cell 90 and electronic parts 10 are mounted, it can be managed even if it does not attach a phase contrast plate, a polarizing plate, and electronic parts in a defect's panel, and cost can be reduced. Thus, since the signal-electrode connection wiring 12 formed in the bottom substrate 2 of the obtained liquid crystal display 1, the wiring 14 for scan electrodes, and the wiring 41 for a signal input are covered by the 1st protective layer 82 except for the connection with IC10 for a drive and they can serve also as an insulation, it is easy to deal with them and easy to build them into electronic equipment.

[0101] By the manufacture approach of the liquid crystal display of the gestalt this operation IC10 for a drive is mounted in the external surface side of the bottom substrate 2, and the signal electrode 6 was formed covering the external surface of the bottom substrate 2 through the interior of a substrate from the inside of the bottom substrate 2, and is object[for signal electrodes]-******(ed), and it has connected with IC10 for a drive electrically through wiring 11. On the other hand, the scan electrode 7 Since between substrates is crossed from the inside of the top substrate 3, and it was prepared in the inside of the bottom substrate 2 covering the external surface of the bottom substrate 2 through the interior of a substrate from the inside of the bottom substrate 2, it object[for scan electrodes]-****** further inside and it has connected with IC10 for a drive electrically through wiring 13 It object[for scan electrodes]-******. the object for signal electrodes -- ******(ing) -- wiring 11 -- the both sides of wiring 13 The liquid crystal display 1 lengthened about through the interior of the bottom substrate 2 at the external surface side of the bottom substrate 2 is obtained from each inside. the bottom substrate 2 and the top substrate 3 -- Moreover, while while constitutes the liquid crystal display itself and the bottom substrate 2 is operated as a substrate, it can be made to function also as a loading substrate of a drive circuit.

[0102] therefore, according to the liquid crystal display 1 manufactured by the manufacture approach of the gestalt this operation, in the conventional configuration, it had prepared in the viewing-area outside of a bottom substrate inside -- lengthening -- turning -- a field -- since the mounting field of FPC or electronic parts becomes still more unnecessary, only the part can narrow a frame sharply compared with the former. Moreover, since much connection wiring can be arranged all over the

external surface side of the bottom substrate 2 including the inside of a viewing area 9 and the pitch during connection wiring can be designed with allowances, the problem that lengthen about and resistance increases does not arise. Moreover, it can lengthen about in this way, generating of a cross talk can be improved by low resistance-ization of wiring, and display grace can be improved.
[0103] Moreover, since it lengthens about as mentioned above and a current carrying part can arrange all over the external-surface side of the bottom substrate 2 even if it lengthens about with the increment in display capacity and makes [many] the number of wiring, it lengthens about, and the line breadth and the pitch of wiring can design with allowances, and it lengthens about compared with the conventional liquid-crystal equipment which lengthened about and had established the field in the viewing-area outside of a bottom substrate inside, and is hard defects, such as an open circuit of wiring, generate.
[0104] Furthermore, as polyimide was used for the ingredient of the bottom substrate 2 with the gestalt of this operation, since the bottom substrate 2 does not necessarily need to be a transparence substrate, it can also use resin substrates, such as polyimide besides transparence substrates, such as common glass and a quartz, a ceramic substrate, etc. from the former as a substrate ingredient of a liquid crystal display, and its degree of freedom of ingredient selection of the bottom substrate 2 improves. For example, since the rigidity of a bottom substrate improves when a ceramic substrate is used for the bottom substrate 2, the liquid crystal display which it was hard coming for deformation of a substrate to be generated, and was excellent in the homogeneity of a cel gap, as a result the homogeneity of a display is obtained.
[0105] Moreover, the substrate with which an up-and-down substrate has the flexibility of a plastic film substrate etc. may be used. If it is made this configuration, an advantage, like a curved-surface display is attained by incurvating the substrate which breakage of the crack of a substrate which can attain thin-shape-izing of the liquid crystal display obtained and lightweight-ization stops being able to produce easily is acquired, and the suitable liquid crystal display for electronic equipment, such as a pocket device, can be manufactured.
[0106] Moreover, as a bottom substrate 2, when using a plastic film substrate, it is desirable to use the thing in which the gas barrier layer was formed to both sides of this substrate. As a gas barrier layer here, SiOx etc. and the organic film denser than a plastic film substrate can be used. The moisture and oxygen in air advance into the liquid crystal layer 28 through a plastic plate, and it has a possibility that degradation of the liquid crystal layer 28 may become early, if the above gas barrier layers are not formed, since a plastic film substrate is inferior to dense nature compared with a glass substrate.
[0107] Moreover, a through hole can be easily formed by operating laser beam machining, chemical etching, etc. which were mentioned above to this bottom substrate 2 as the bottom substrate 2 is a substrate which has flexibility. furthermore, the 1st hole which consists of a conductive ingredient in a through hole by performing restoration of a silver paste into this through hole etc., electrolytic plating, etc. -- the inside connections 15 and 30 and the 2nd hole -- the inside connection 20 can be formed. On the other hand, the 1st external surface top connection 12 and the 2nd external surface top connection 14 can be easily formed with the usual wiring formation techniques, such as membrane formation of the electric conduction film, and patterning, as mentioned above, and they can form the connections 19 and 40 between substrates by the approach of mixing electric conduction material in a sealant.
[0108] therefore, said approach -- the 1st hole -- by forming the inside connection 15 or 30 The 1st external surface top connection 12 is electrically connectable with a signal electrode 6 through the inside connection 15 or 30. this 1st hole -- the aforementioned approach -- the 2nd hole -- forming the inside connection 20 -- this 2nd hole, since the 2nd external surface top connection 14 is electrically connectable with the scan electrode 7 through the inside connection 20 and the connection 19 between substrates Lengthen about, and a current carrying part can lengthen about to the external surface side of this substrate 2 through the interior of the bottom substrate 2, and further by all the things of the bottom and the top substrates 2 and 3 for which IC10 for a drive is mounted in the external surface side of this bottom substrate 2 While while constitutes the liquid crystal display itself and the bottom substrate 2 is operated as a substrate, it can be made to function also as a loading substrate of a drive circuit.

[0109] Moreover, when it mounts FPC for supplying a driving signal etc. in IC10 for a drive further by having formed the external connection terminal 26 in the periphery section of bottom substrate 2 external surface, alignment at the time of connecting the external connection terminal 26 and the terminal of FPC can be performed easily. Moreover, although stress may occur in a part for a joint the time of FPC junction, or after junction, if the location is the substrate periphery section from which it separated from the viewing area 9, said stress will not have a bad influence on a display.
[0110] since the location of the through holes 17 and 38 of the bottom substrate 2 has been arranged on the outside of a sealant 27 in the case of the gestalt of this operation -- the hole of through holes 17 and 38 -- it is convenient in any way on image display, without it seeming that the cel gap of the viewing area 9 of the sealant 27 interior changes under the effect even if the part of the inside connections 15 and 20 serves as a configuration which rose a little on the bottom substrate 2.
[0111] Moreover, although simplification of a production process was able to be attained with the gestalt of this operation since various connection wiring by the side of the signal-electrode 6 grade by the side of the inside of the bottom substrate 2 and external surface etc. was formed using the same ingredients, such as aluminum, as mentioned above, various connection wiring by the side of the signal-electrode 6 grade by the side of the inside of the bottom substrate 2 and external surface etc. may be formed with a different ingredient. For example, you may make it use for connection wiring by the side of external surface metallic materials, such as copper which is low electrical resistance materials, at the signal electrode 6 by the side of an inside using metallic materials, such as silver with the high rate of a light reflex (or alloy containing silver), and aluminum. If it does in this way, instead of not being obtained, the aforementioned advantage of simplification of a production process is lengthened about, and can aim at much more reduction of resistance.
[0112] Moreover, as the through hole which forms a conductive layer in the inside-and-outside side of a substrate, and penetrates a substrate shows the configuration of the bottom substrate 2 not only to a substrate but to drawing 13 which aims at the flow of the conductive layer of an inside-and-outside side, the substrate which has the internal conductive layer 42 of one or more layers, and a substrate like the so-called multilayer printed circuit board may be used for the interior of the bottom substrate 2. In this case, the electric flow between the inside of the bottom substrate 2, and external surface Between the inside of the bottom substrate 2, and the internal conductive layers 42 The connection 44 in a hole in the beer hall 43 through which it penetrates and flows, and the connection 46 (or in a certain case, an internal conductive layer between mutual internal conductive layers more than two-layer) in a hole in the beer hall 45 which penetrates and flows through between the external surface of the bottom substrate 2, and the internal conductive layers 42 It will be made by the connection in a hole in the beer hall through which it penetrates and flows.
[0113] When this kind of substrate was used for the bottom substrate 2 and it becomes difficult to lengthen about, for example, and for the number of wiring to increase, and for a large number to lengthen about only on the external surface of a bottom substrate, and to draw wiring about, a part lengthens about and wiring can be drawn also about via an internal conductive layer. Then, since the degree of freedom of length **** improves, it becomes possible to correspond also to increase of display capacity.
[0114] The liquid crystal equipment obtained with the gestalt of implementation of the 2nd of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 14 - drawing 16 below [the gestalt of the 2nd operation].
[0115] The gestalt of this operation as well as the gestalt of the 1st operation is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of a passive matrix mold liquid crystal display, and is the example of manufacture of the liquid crystal display which has the display electrode which served as the light reflex section, and the so-called reflector.
[0116] A top substrate and a bottom substrate are the same configurations mostly, and different points from the liquid crystal display obtained with the gestalt of the 1st operation differ in the location of the through hole on a bottom substrate, and the location of an external connection terminal. While making a bottom substrate larger than the appearance of a top substrate and arranging a through hole on the outside of a sealant, the external connection terminal made the top substrate and the bottom substrate almost equal magnitude, and arranges a through hole directly

under a sealant by the gestalt of this operation with the gestalt of the 1st operation to having been arranged along the substrate side of the field which the bottom substrate jutted out from the top substrate on the external surface of a bottom substrate. That is, the through hole is arranged to the formation field of a sealant. Furthermore, arrangement of an external connection terminal is arranged to the field with which vertical both substrates lap on the external surface of a bottom substrate.
[0117] Thus, the liquid crystal display obtained with the gestalt of the 1st operation, and since the outline configuration of the liquid crystal display obtained with the gestalt of this operation is common, it omits illustration and explanation about a common configuration. Drawing 14 is drawing corresponding to drawing 6 shown with the gestalt of the 1st operation, and the perspective drawing showing the condition of having piled up the top substrate and the bottom substrate, the sectional view where drawing 15 meets the A-A' line of drawing 14 , and drawing 16 are sectional views which meet the B-B' line of drawing 14 . In addition, in these drawings, the same sign is attached about drawing 1 - drawing 13 , and a common component.
[0118] As the liquid crystal display 50 obtained with the gestalt of this operation is shown in drawing 14 , many signal electrodes 6 (the 1st current carrying part) are formed in the shape of a stripe on the inside of the bottom substrate 2, and the connection wiring 18 for signal electrodes which has a through hole in the center of the land 16 at a tip is formed in the end of the die-length direction (the wiring formation direction) of each signal electrode 6. On the inside of this and the top substrate 3 which counters, many scan electrodes 7 (the 2nd current carrying part) are formed in the shape of a stripe in the direction which intersects perpendicularly with a signal electrode 6. As shown in drawing 15 and drawing 16 , and on the external surface of the bottom substrate 2 The connection wiring 12 (1st external surface top connection) for signal electrodes which object[for signal electrodes]-****** and constitutes some wiring 11 (the 1st lengthening about current carrying part), And the connection wiring 14 (2nd external surface top connection) for scan electrodes which object[for scan electrodes]-****** and constitutes some wiring 13 (the 2nd lengthening about current carrying part) is arranged, respectively, and is electrically connected with IC10 for a drive. Furthermore, on the external surface of the bottom substrate 2, the external connection terminal 26 and the wiring 41 grade for a signal input are prepared. The above configuration is the same as that of the liquid crystal display obtained with the gestalt of the 1st operation.
[0119] Moreover, since in the case of the liquid crystal display manufactured with the gestalt of the 1st operation the location of a through hole 38 separated on the outside of the location of a sealant 27 (vertical flow section) and was arranged on it, the connection wiring 21 for scan electrodes which connects electrically between a sealant 27 and the connections 20 in a hole in a through hole 38 was formed on the inside of the outside of the sealant of the bottom substrate 2. On the other hand, since a through hole 38 and a sealant 27 are in the same location in the case of the liquid crystal display manufactured with the gestalt of this operation, especially the thing equivalent to the connection wiring 21 for scan electrodes on the bottom substrate 2 inside in the gestalt of the 1st operation is unnecessary. Therefore, the land 22 of the rectangle of the number corresponding to the number of each scan electrode 7 on the top substrate 3 arranged in the location which counters this is formed in the field to which the sealant 27 on the inside of the bottom substrate 2 is arranged. The through hole 38 which penetrates between the inside of the bottom substrate 2 and external surface is formed in the center of these lands 22.
[0120] namely, if drawing 6 is anew compared with drawing 14 , in the liquid crystal display manufactured with the gestalt of the 1st operation As shown in drawing 6 , the part of the land 16 of each connection wiring 18 for signal electrodes on the inside of the bottom substrate 2 is overflowed and located in the outside (outside of the top substrate 3) of a sealant 27. The part of the circular land 23 in which the through hole 38 of the edge of each connection wiring 21 for scan electrodes was established is overflowed and located in the outside (outside of the top substrate 3) of a sealant 27. On the other hand, in the liquid crystal display manufactured with the gestalt of this operation, as shown in drawing 14 , the part of the land 16 of each connection wiring 18 for signal electrodes on the inside of the bottom substrate 2 is located directly under a sealant 27, and the part of the land 22 of the rectangle for a vertical flow prepared corresponding to each scan electrode 7 is also located directly under a sealant 27. That is, all the lands 22 which aim at the flow between vertical

substrates, the lands 16 and 23 which aim at the flow from the inside of the bottom substrate 2 to an external surface top in a list, and through holes 17 and 38 are arranged in the formation field of a sealant 27.

[0121] When this configuration is seen with cross-section structure, it is as being shown in drawing 15 and drawing 16 . That is, while the signal electrode 6 on the inside of the bottom substrate 2 and a signal electrode 6, and the connection wiring 18 for signal electrodes of one will be formed as shown in drawing 15 if it cuts in the direction which met the signal electrode 6, on the external surface of the bottom substrate 2, the connection wiring 12 for signal electrodes is formed. And the through hole 17 which penetrates a substrate is formed in the part of the lands 16 and 24 of the connection wiring 18 and 12 for signal electrodes of the both sides which hit directly under a sealant 27. The interior of a through hole 17 is filled up with conductive ingredients, such as a silver paste, and the connection 15 in a hole consists of that this conductive ingredient connects the connection wiring 18 for signal electrodes by the side of an inside, and the connection wiring 12 for signal electrodes by the side of external surface. Moreover, the terminal 31 of IC10 for a drive is connected to the edge of the opposite side the side in which the through hole 17 of the connection wiring 12 for signal electrodes on the external surface of the bottom substrate 2 was established. a hole -- it is the same as that of the liquid crystal display manufactured with the gestalt of the 1st operation that various structures as shown in drawing 11 (a), (b), and drawing 12 are employable as a concrete configuration of an inside connection.

[0122] taking the above wiring structures -- the picture signal from IC10 for a drive -- the connection wiring 12 for signal electrodes on the external surface of the bottom substrate 2, and a hole -- each signal electrode 6 is supplied via the connection wiring 18 for signal electrodes on the inside of the inside connection 15 and the bottom substrate 2. therefore, the connection wiring 12 for signal electrodes on the external surface of these bottom substrate 2 and a hole -- the connection wiring 18 for signal electrodes on the inside of the inside connection 15 and the bottom substrate 2 will object [for signal electrodes]-******, and will constitute wiring (the 1st lengthening about current carrying part) 11.

[0123] On the other hand, on the inside of the top substrate 3, if it cuts in the direction which met the scan electrode 7, as shown in drawing 16 , the scan electrode 7 is formed so that the top face of a sealant 27 may be contacted. Moreover, on the inside of the bottom substrate 2, the land 22 for connection with the scan electrode 7 is formed so that the inferior surface of tongue of a sealant 27 may be contacted with many signal electrodes 6. Electric conduction material, such as metal particles, is mixed in the interior of a sealant 27, it connects electrically and the scan electrode 7 and land 22 which contacted the top face and inferior surface of tongue of a sealant 27, respectively constitute the vertical flow section 19.

[0124] Furthermore, the through hole 38 is formed in the parts of the land 22 by the side of the inside of the bottom substrate 2, and the land 25 at the tip of the connection wiring 14 for scan electrodes by the side of external surface. The interior of a through hole 38 was filled up with conductive ingredients, such as a silver paste, and this conductive ingredient constituted the connection 20 in a hole, and has connected electrically the land 22 by the side of an inside, and the connection wiring 14 for scan electrodes by the side of external surface. Moreover, the terminal 31 of IC10 for a drive is connected to the edge of the opposite side the side in which the through hole 38 of the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2 was established. the scan signal outputted from IC10 for a drive by taking the above wiring structures -- the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2, and a hole -- each scan electrode 7 is supplied via the land 22 on the inside of the inside connection 20 and the bottom substrate 2, and the vertical flow section 19. therefore, the connection wiring 14 for scan electrodes on the external surface of these bottom substrate 2 and a hole -- the land 22 and the vertical flow section 19 on the inside of the inside connection 20 and the bottom substrate 2 will object[for scan electrodes]-******, and will constitute wiring 13.

[0125] The place where the manufacture approach of the liquid crystal display of the gestalt the 2nd operation differs from the gestalt of the 1st operation With the gestalt of the 1st operation, patterning of the conductive thin film which formed membranes to both sides of the bottom substrate 2 is performed, and the signal electrode 6 by the side of bottom substrate 2 inside, each connection

wiring 18 and 21, the connection wiring 12 for signal electrodes by the side of external surface, the connection wiring 14 for scan electrodes, and the wiring 41 grade for a signal input are formed collectively. Again In case a through hole 38 is formed in the bottom substrate 2, when sticking substrates 2 and 3 at a back process, in order to make it the location of a sealant 27 (vertical flow section) separate, the connection 20 in a hole As opposed to having formed the through hole 38 in the location outside a sealant 27 with the gestalt of this 2nd operation So that the connection 20 in a hole may become directly under the ** sealant 27 (vertical flow section) when sticking substrates 2 and 3 at a back process in case a through hole 38 is formed in the bottom substrate 2 By forming a through hole 38 in the same location as a sealant 27, and arranging a through hole 38 just under a sealant 27 in this way When performing patterning of the conductive thin film which formed membranes to both sides of the bottom substrate 2 at the previous process and forming each electrode and wiring for connection, the connection wiring 21 for scan electrodes is a point which is not formed.

[0126] Since the parts of the land 16 of each connection wiring 18 for signal electrodes on the inside of the bottom substrate 2 or the land 22 connected with the scan electrode 7 have not overflowed into the outside of a sealant 27 like the liquid crystal display manufactured with the gestalt of the 1st operation in the case of the liquid crystal display manufactured with the gestalt of this operation, the appearance of the bottom substrate 2 and the appearance of the top substrate 3 are made to the magnitude of same extent. Consequently, compared with the liquid crystal display manufactured with the gestalt of the 1st operation, narrow picture frame-ization can be attained further.

[0127] The liquid crystal equipment obtained with the gestalt of implementation of the 3rd of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 17 and drawing 18 below [the gestalt of the 3rd operation].

[0128] The gestalt of this operation as well as the gestalt of the 1st and the 2nd operation is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of a passive matrix mold liquid crystal display, and is the example of manufacture of the liquid crystal display which has the display electrode which served as the light reflex section, and the so-called reflector. And the liquid crystal display manufactured with the gestalt of this operation is the example which equipped the bottom substrate with the color filter and realized the reflective color LCD panel.

[0129] The 1st, the liquid crystal display obtained with the gestalt of the 2nd operation, and since the outline configuration of the liquid crystal display obtained with the gestalt of this operation is common, it omits illustration and explanation about a common configuration. The sectional view corresponding to drawing 7 (sectional view which meets the A-A' line of drawing 6) which showed drawing 17 with the gestalt of the 1st operation, and drawing 18 are the sectional views corresponding to drawing 8 (sectional view which meets the B-B' line of drawing 6) shown with the gestalt of the 1st operation. In addition, in these drawings, the same sign is attached about drawing 7 , drawing 8 , and a common component.

[0130] In the liquid crystal display 52 manufactured with the gestalt of this operation, as shown in drawing 17 and drawing 18 , an insulator layer 53 is formed throughout a viewing area so that the signal electrode 6 of the bottom substrate 2 may be covered, and the color filter 54 is formed on the insulator layer 53. The color filter 54 consists of the red (R) and green (G) which were formed corresponding to each pixel, a color-material layer 55 of three blue (B) colors, and a light-shielding film 56 (black matrix) of the shape of a grid which consists of a metal membrane, a black resist, etc. And the orientation film 35 is formed on the color filter 54. the electrode configuration of a signal electrode 6 and scan electrode 7 grade, and the object for signal electrodes -- ******(ing) -- wiring 11 -- it object[for scan electrodes]-****** and is completely the same as that of the gestalt of said 1st operation about the wiring configuration of wiring 13 grade.

[0131] The place where the manufacture approach of the liquid crystal display of the gestalt this operation differs from the gestalt of the 1st operation As opposed to having formed the orientation film 35 with the gestalt of the 1st operation, so that a signal electrode 6 might be covered on the signal electrode 6 of the bottom substrate 2 with the gestalt of this 3rd operation It is the point which forms an insulator layer 53 throughout a viewing area so that a signal electrode 6 may be covered on the signal electrode 6 of the bottom substrate 2, forms a color filter 54 on that insulator layer 53, and

forms the orientation film 35 on this color filter 54 further.
[0132] In the liquid crystal display obtained by the manufacture approach of the gestalt this operation, since it has the color filter 54 on the inside of the bottom substrate 2, the miniaturization by the narrow picture frame can be attained, the high color liquid crystal display of display quality can be realized, and it becomes a suitable thing for the pocket electronic equipment by which it is expected that colorization will progress further from now on. Moreover, in this example, although the color filter is formed in a bottom substrate side, you may form in a top substrate side and trouble is not caused to the effectiveness at all.
[0133] The liquid crystal equipment obtained with the gestalt of implementation of the 4th of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 19 and drawing 20 below [the gestalt of the 4th operation].
[0134] It is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of a passive matrix mold liquid crystal display like [the gestalt of this operation] the gestalt of the 1st - the 3rd operation. However, it is the example of manufacture of the reflective mold liquid crystal display of the type with which the manufacture approach of the liquid crystal display of the gestalt this operation has a reflecting layer and a display electrode separately to having been the example of manufacture of the reflective mold liquid crystal display of the type which has a reflector with the gestalt of the 1st - the 3rd operation.
[0135] The gestalt of the 1st and the 2nd operation, and since the whole liquid crystal display configuration obtained with the gestalt of this operation is common, it omits illustration and explanation about a common configuration. The sectional view corresponding to drawing 7 (sectional view which meets the A-A' line of drawing 6) which showed drawing 19 with the gestalt of the 1st operation, and drawing 20 are the sectional views corresponding to drawing 8 (sectional view which meets the B-B' line of drawing 6) shown with the gestalt of the 1st operation. In addition, in these drawings, the same sign is attached about drawing 7 , drawing 8 , and a common component.
[0136] In the liquid crystal display 58 manufactured with the gestalt of this operation, as shown in drawing 19 and drawing 20 , the reflecting layer 59 which consists of a metal thin film with high rates of a light reflex, such as aluminum and silver (or alloy containing silver), throughout the viewing area on the bottom substrate 2 is formed. And an insulator layer 60 is formed so that this reflecting layer 59 may be covered, and many signal electrodes 6 are formed in the shape of a stripe on that insulator layer 60. Out of an insulator layer 60 and the formation field of a reflecting layer 59, since the signal electrode 6 is in the condition of having been directly formed on the bottom substrate 2, the connection structure of the part of through holes 17 and 38 of it is completely the same as the gestalt of the 1st operation. Moreover, as shown in drawing 21 , the connection wiring 18 for signal electrodes is formed in coincidence in case a reflecting layer 59 is formed, an insulator layer 59 forms in reflecting layer 59 front face in a viewing area at least, and many signal electrodes 6 are formed in the shape of a stripe on the insulator layer 60. A signal electrode 6 is good also as a configuration through which it is extended and is made to flow electrically with the connection wiring 18 for signal electrodes. In the case of the liquid crystal display 58 manufactured with the gestalt of this operation, a signal electrode 6 does not serve as a light reflex layer, but the reflecting layer 59 is separately formed under the signal electrode 6. Therefore, since incidence is carried out from a way outside the top substrate 3 at the time of a display, the light which penetrated the liquid crystal layer 28 reflects on the front face of a reflecting layer 59 and image display is made, the signal electrode 6 located above a reflecting layer 59 must be transparent. Therefore, in the gestalt of this operation, the signal electrode 6 is formed by translucency electric conduction film, such as ITO, as well as the scan electrode 7 of the top substrate 3. Moreover, although the connection wiring 21 for scan electrodes which connects electrically the vertical flow section 19 of the part of a sealant 27 and the connection 20 in a hole of the part of a through hole 38 is formed on the inside of the bottom substrate 2 like the liquid crystal display manufactured with the gestalt of the 1st operation as shown in drawing 20 This connection wiring 21 for scan electrodes may be formed by metal membranes which are the same ingredients as a reflecting layer 59, such as aluminum and silver (or alloy containing silver), and may be formed by translucency electric conduction film, such as ITO which is the same ingredient as a signal electrode 6. make it any -- as long as the same ingredient as a

reflecting layer 59 or a signal electrode 6 is used, a production process does not increase
[0137] On the other hand, the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, wiring for a signal input, etc. are prepared in the external surface side of the bottom substrate 2, and although it is the same as that of the gestalt of the 1st operation about these wiring lengthening about, low resistance metallic materials, such as copper, are used as an ingredient of wiring.
[0138] The place where the manufacture approach of the liquid crystal display of the gestalt this operation differs from the gestalt of the 1st operation As opposed to having carried out patterning of the conductive thin film which becomes the inside of the bottom substrate 2 from metallic materials, such as aluminum, with the gestalt of the 1st operation, and having formed the signal electrode 6 with the gestalt of this 4th operation Form a metal thin film with high rates of a light reflex, such as aluminum and silver, throughout the viewing area on the bottom substrate 2, and a reflecting layer 59 is formed. It is the point which carries out patterning of the translucency electric conduction film, such as ITO which the insulator layer 60 was formed so that this reflecting layer 59 might be covered, and was formed on the reflecting layer 59 and the substrate 2 outside the formation field of an insulator layer 60, and the insulator layer 60, and forms many signal electrodes 6 in the shape of a stripe.
[0139] the manufacture approach of the liquid crystal display of the gestalt this operation -- also setting -- the bottom substrate 2 -- through holes 17 and 38 -- preparing -- a signal electrode 6 and the scan electrode 7 -- it lengthens about, wiring 11 and 13 is drawn about to the external surface side of the bottom substrate 2, and the same effectiveness as the gestalt of the 1st - the 3rd operation that narrow picture frame-ization can be attained can be acquired by [each] having mounted IC10 for a drive.
[0140] Since a reflecting layer 59 and a signal electrode 6 are formed separately in the manufacture approach of the liquid crystal display of the gestalt this operation, a property required as a reflecting layer with which a liquid crystal display is equipped, and a property required as a signal electrode can be divided and considered, and especially the degree of freedom of a design of a signal electrode can be raised. And although a manufacture process becomes complicated a little by differing from the conductive layer ingredient by the side of an inside in order to use low resistance metallic materials, such as copper, for various connection wiring of bottom substrate 2 external surface in the manufacture approach of the liquid crystal display this operation, it lengthens about, resistance can be ******(ed) and improvement in the display quality of a liquid crystal display can be aimed at.
[0141] The liquid crystal display obtained with the gestalt of implementation of the 5th of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 22 below [the gestalt of the 5th operation].
[0142] Although said gestalt of the 1st - the 4th operation showed the example of manufacture of a passive matrix mold liquid crystal display, the gestalt of this operation shows the example of application of this invention to the manufacture approach of the reflective mold liquid crystal display of the active matrix which used TFD for the switching element. Drawing 22 (a) is the perspective view showing the whole liquid crystal display configuration obtained with the gestalt of this operation, and drawing 22 (b) is a 1-pixel enlarged drawing in drawing 22 (a).
[0143] As the liquid crystal display 61 obtained with the gestalt of this operation is shown in drawing 22 (a), opposite arrangement of the near component substrate 62 (the 1st substrate) and the near opposite substrate 63 (the 2nd substrate) with which two substrates, i.e., a TFD component, were formed is carried out, and liquid crystal (illustration abbreviation) is enclosed among these substrates. In addition, the orientation film is formed in the inside of each substrate which touches liquid crystal in fact although illustration is omitted. Much data lines 64 (the 1st current carrying part) are formed, and many pixel electrodes 65 are connected to the inside side of the component substrate 62 through the TFD component 66 to each data line 64. On the other hand, strip-of-paper-like much scanning lines 67 (the 2nd current carrying part) are formed in the direction which intersects the data line at the inside side of the opposite substrate 63.
[0144] Moreover, connection wiring for the data lines and connection wiring for the scanning lines (all are illustration abbreviation) are prepared in the external surface of the component substrate 62, and the data-line drive circuit and scanning-line drive circuit (all are illustration abbreviation) which

drive the data line 64 and the scanning line 67, respectively are formed in it, respectively. Moreover, the 1st protective layer (illustration abbreviation) is formed in the field except the field where said data-line drive circuit and the scanning-line drive circuit were formed in the external surface of this component substrate 62, and said connection wiring for the data lines and said connection wiring for the scanning lines are covered with this 1st protective layer.

[0145] The TFD component 66 consists of the 2nd electric conduction film 70 which consists of the 1st electric conduction film 68 which consists of tantalum film, an insulator layer 69 which consists of tantalic acid-ized film formed in the front face of the 1st electric conduction film 68 of anodic oxidation, and metal membranes, such as chromium formed in the front face of an insulator layer 69, aluminum, titanium, and molybdenum, as shown in drawing 22 (b). And the 1st electric conduction film 68 of the TFD component 66 is connected to the data line 64, and the 2nd electric conduction film 70 is connected to the pixel electrode 65. In the case of the liquid crystal display obtained with the gestalt of this operation, the pixel electrode 65 is a reflector which serves as a light reflex layer, and is formed from the metal thin film with high rates of a light reflex, such as aluminum. Or like the gestalt of the 4th operation, the pixel electrode 65 may be formed by translucency electric conduction film, such as ITO, and a reflecting layer may be separately formed under the pixel electrode 65. On the other hand, the scanning line 67 of the inside of the opposite substrate 63 is formed by translucency electric conduction film, such as ITO.

[0146] And in the case of the liquid crystal display 61 obtained with the gestalt of this operation, the end of each data line 64 of the inside of the component substrate 62 is formed in the shape of a rectangle, and the through hole 71 which penetrates an inside [of the component substrate 62] and external surface side into this part is formed. Cross-section structure becomes being the same as that of what transposed the signal electrode 6 to the data line 64 of the gestalt of this operation in drawing 7 and drawing 8 which were shown with the gestalt of the 1st operation.

[0147] That is, while the data line 64 is formed on the inside of the component substrate 62, connection wiring for the data lines is formed on the external surface of the component substrate 62, and the through hole 71 which penetrates a substrate is formed at the tip of wiring of both sides. The interior of a through hole 71 is filled up with conductive ingredients, such as a silver paste, and the connection in a hole consists of that this conductive ingredient connects the data line by the side of an inside, and connection wiring for the data lines by the side of external surface. And IC for a drive is connected to the other end of connection wiring for the data lines. By taking the above wiring structures, the picture signal outputted from IC for a drive is supplied to each data line 64 via connection wiring for the data lines on the external surface of the component substrate 62, and the connection in a hole. That is, connection wiring for the data lines on the external surface of these components substrate 62 and the connection in a hole will object[for the data lines]-******, and will constitute wiring.

[0148] On the other hand, about the scanning-line 67 side of the opposite substrate 63, the scanning line 67 is formed so that the top face of a sealant may be contacted. Electric conduction material, such as metal particles, is mixed into the sealant, it connects electrically and the top face and inferior surface of tongue of a sealant constitute the vertical flow section. the land and the through hole are formed and conductive ingredients, such as a silver paste, fill up the interior of a through hole with the part equivalent to the lower part of the vertical flow section of the component substrate 62 -- having -- this conductive ingredient -- the connection in a hole -- constituting -- this hole -- the scanning line 67 by the side of the inside of the opposite substrate 63 and connection wiring for the scanning lines by the side of the external surface of the component substrate 62 are electrically connected through an inside connection and the vertical flow section. Moreover, IC for a drive is connected to the other end of connection wiring for the scanning lines on the external surface of a component substrate. By taking the above wiring structures, the scan signal outputted from IC for a drive is supplied to each scanning line 67 on the opposite substrate 63 via connection wiring for the scanning lines on the external surface of the component substrate 62, the connection in a hole, and the vertical flow section. That is, connection wiring for the scanning lines on the external surface of these components substrate 62, the connection in a hole, and the vertical flow section will object[for the scanning lines]-******, and will constitute wiring.

[0149] Hereafter, the manufacture approach of the liquid crystal display of the gestalt this operation

is explained.
[0150] First, business of the polyimide substrate is carried out as an ingredient of the component substrate 62, the data line 64, the TFD component 66, and the pixel electrode 65 are formed on the whole surface (field used as an inside) of this substrate, and, on the other hand, connection wiring for the data lines and connection wiring for the scanning lines are formed in the field (field used as external surface) of another side.
[0151] Next, the through hole 71 for the data lines is formed in the predetermined part of the edge of the data line 64 on this substrate, and further, when sticking substrates 62 and 63 through a sealant at a back process, the through hole for the scanning lines in which it is located just under a sealant is formed in this substrate. then, the interior of the through hole 71 for the data lines -- conductive ingredients, such as a silver paste, -- being filled up -- a hole -- an inside connection is formed and it flows through during each data line 64 of substrate both sides, and connection wiring for the data lines electrically -- making -- the interior of the through hole for a scan on the other hand -- conductive ingredients, such as a silver paste, -- being filled up -- a hole -- an inside connection -- forming -- this hole -- it is made to flow through between connection wiring for the scanning lines of inside connection and substrate 62 external surface electrically
[0152] Then, the external surface of the component substrate 62 is covered all over abbreviation, resin, such as polyimide and a resist, is applied and hardened, the 1st protective layer is formed, and connection wiring for the data lines by the side of external surface and connection wiring for the scanning lines are protected.
[0153] On the other hand, transparence substrates, such as a polycarbonate, are prepared as an ingredient of the opposite substrate 63, and the scanning line 67 is formed in the whole surface (field used as inside) side of a substrate. In case the scanning line 67 is formed here, when sticking substrates 62 and 63 through a sealant at a back process, it forms so that the top face of a sealant and the edge of the scanning line 67 may contact.
[0154] Next, if the orientation film is formed on the inside of the both sides of both substrates, respectively, the component substrate 62 and the opposite substrate 63 will be obtained.
[0155] Subsequently, either substrate of the component substrate 62 and the opposite substrate 63 is arranged on a surface plate, a spacer is sprinkled on this substrate, after printing the resin ingredient used as a sealant, the component substrate 2 and the opposite substrate 3 are piled up and pressurized, lamination and said sealant are stiffened, and an empty cel is produced. In order to make the part of a sealant into the vertical flow section, electric conduction material, such as metal particles, is made to mix into the resin ingredient used as a sealant in the case of the gestalt of this operation. If it does in this way, the scanning line 67 and connection wiring for scan electrodes will be electrically connected with a sealant through the connection in a hole.
[0156] Next, liquid crystal is poured in from the liquid crystal inlet of a sealant into an empty cel, and a liquid crystal cell is obtained by closing a liquid crystal inlet. Then, the part on a connection field with IC for a drive exfoliates among the 1st protective layer formed on connection wiring for the data lines, and connection wiring for the scanning lines, and the edge (the 1st linked to electronic parts lengthens about, and it is the terminal area of a current carrying part) of connection wiring for the data lines and the edge (it lengthens about in the 2nd [connect / with electronic parts], and it is the terminal area of a current carrying part) of connection wiring for the scanning lines in a connection field with IC for a drive expose.
[0157] Subsequently, sequential attachment of a phase contrast plate (illustration abbreviation) and the polarizing plate (illustration abbreviation) is carried out at the external surface side of the opposite substrate 63 of said liquid crystal cell. Then, IC for a drive is mounted in the connection field of IC for a drive formed in the external surface side of the component substrate 62 with gestalten, such as face down mounting and face-up mounting. A liquid crystal display 61 is completed according to the above process.
[0158] Although the gestalt of this operation is the example of manufacture of the active matrix liquid crystal indicating equipment which used the TFD component, the same effectiveness as the example of manufacture of the passive matrix mold liquid crystal display of said gestalt of the 1st - the 4th operation can be acquired also in this case. That is, since the liquid crystal display obtained by the manufacture approach of the gestalt this operation stops needing the tooth space which

lengthens about to the viewing area exterior of the inside of the component substrate 62, and arranges wiring and can moreover arrange formation fields, such as a data line drive circuit required for a TFD active matrix liquid crystal indicating equipment, and a scanning line drive circuit, to the external surface side of the component substrate 62, it can attain large narrow picture frame-ization. Moreover, since the external surface side whole region of the component substrate 62 is lengthened about and it can do with the tooth space for wiring, sufficient wiring pitch can be secured, it lengthens about, and increase of resistance is not caused.

[0159] The liquid crystal equipment obtained with the gestalt of implementation of the 6th of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 23 below [the gestalt of the 6th operation].

[0160] The gestalt of this operation shows the example of application of this invention to the manufacture approach of the reflective mold liquid crystal display of the active matrix which used TFT for the switching element. Drawing 23 (a) is the perspective view showing the whole liquid crystal display configuration obtained with the gestalt of this operation, and drawing 23 (b) is a 1-pixel enlarged drawing in drawing 23 (a).

[0161] The liquid crystal display 73 obtained with the gestalt of this operation has the almost same configuration as the TFD mold liquid crystal display obtained by the manufacture approach of the gestalt the 5th operation, as shown in drawing 23 (a). That is, opposite arrangement of the near component substrate 74 (the 1st substrate) and the near opposite substrate 75 (the 2nd substrate) with which the TFT component was formed is carried out, and liquid crystal (illustration abbreviation) is enclosed among these substrates. It is prepared in the shape of a grid so that many source lines 76 (the data line, the 1st current carrying part) and many gate lines 77 (the scanning line, the 1st current carrying part) may intersect the inside side of the component substrate 74 mutually. The TFT component 78 is formed near the crossing of each source line 76 and each gate line 77, and the pixel electrode 79 is connected through each TFT component 78. On the other hand, corresponding to the viewing area, the common electrode 80 (the 2nd current carrying part) is formed in the whole inside side surface of the opposite substrate 75.

[0162] Moreover, connection wiring for source lines and connection wiring for gate lines (all are illustration abbreviation) are prepared in the external surface of the component substrate 74, and the source line drive circuit and gate line drive circuit (all are illustration abbreviation) which drive the source line 76 and the gate line 77, respectively are formed, respectively.

[0163] The TFT component 78 has the source electrode 83 prolonged from the source line 76 connected to the source field in a wrap insulator layer (illustration abbreviation), the semi-conductor layer 82 which consists of polycrystalline silicon formed on the insulator layer, an amorphous silicon, etc., and the semi-conductor layer 82 in the gate electrode 81 prolonged from the gate line 77, and the gate electrode 81, and the drain electrode 84 connected to the drain field in the semi-conductor layer 82, as shown in drawing 23 (b). And the drain electrode 84 of the TFT component 78 is connected to the pixel electrode 79. In the liquid crystal display obtained with the gestalt of this operation as well as the liquid crystal display obtained with the gestalt of the 5th operation, the pixel electrode 79 is a reflector which serves as a light reflex layer, and it is formed from the metal thin film with high rates of a light reflex, such as aluminum. Or like the gestalt of the 4th operation, the pixel electrode 79 may be formed by translucency electric conduction film, such as ITO, and a reflecting layer may be separately formed under the pixel electrode 79. On the other hand, the common electrode 80 by the side of the opposite substrate 75 is formed by translucency electric conduction film, such as ITO.

[0164] And in the case of the liquid crystal display 73 obtained with the gestalt of this operation, the end of each source line 76 of the inside of the component substrate 74 is formed in the shape of a rectangle, and the through hole 85 which penetrates an inside [of the component substrate 74] and external surface side into this part is formed. Similarly, the end of each gate line 77 is also formed in the shape of a rectangle, and the through hole 86 which penetrates an inside [of the component substrate 74] and external surface side into this part is formed. The cross-section structure of the part of through holes 85 and 86 becomes being the same as that of what transposed the signal electrode 6 to the source line 76 or the gate line 77 of a gestalt of this operation in drawing 7 and drawing 8 which were shown with the gestalt of the 1st operation.

[0165] That is, while the source line 76 is formed on the inside of the component substrate 74, connection wiring for source lines is formed on the external surface of the component substrate 74, and the through hole 85 which penetrates a substrate is formed at the tip of wiring of both sides. The interior of a through hole 85 is filled up with conductive ingredients, such as a silver paste, and the connection in a hole consists of that this conductive ingredient connects the source line 76 by the side of an inside, and connection wiring for source lines by the side of external surface. And IC for a drive is connected to the other end of connection wiring for source lines. By taking the above wiring structures, the picture signal outputted from IC for a drive is supplied to each source line 76 via connection wiring for source lines on the external surface of the component substrate 74, and the connection in a hole. Therefore, connection wiring for source lines on the external surface of these components substrate 74 and the connection in a hole will object[for source lines]-******, and will constitute wiring.
[0166] The gate line side has also taken the same wiring structure, and the scan signal outputted from IC for a drive is supplied to each gate line 77 via connection wiring for gate lines on the external surface of the component substrate 74, and the connection in a hole. Therefore, connection wiring for gate lines on the external surface of these components substrate 74 and the connection in a hole will object[for gate lines]-******, and will constitute wiring.
[0167] On the other hand, about the common electrode 80 of the opposite substrate 75, it is formed so that some common electrodes 80 may contact the top face of a sealant. Electric conduction material, such as metal particles, is mixed into the sealant, it connects electrically and the top face and inferior surface of tongue of a sealant constitute the vertical flow section. the land and the through hole are formed and conductive ingredients, such as a silver paste, fill up the interior of a through hole with the part equivalent to the lower part of the vertical flow section of the component substrate 74 -- having -- this conductive ingredient -- the connection in a hole -- constituting -- this hole -- connection wiring for common electrodes by the side of the external surface of the component substrate 74 has been electrically connected with the common electrode 80 by the side of the inside of the opposite substrate 75 through an inside connection and the vertical flow section. Connection wiring for common electrodes is grounded in the part of the arbitration by the side of the external surface of the component substrate 74.
[0168] Hereafter, the manufacture approach of the liquid crystal display of the gestalt this operation is explained.
[0169] First, business of the polyimide substrate is carried out as an ingredient of the component substrate 74, the source line 76, the gate line 77, the TFT component 78, and the pixel electrode 79 are formed on the whole surface (field used as an inside) of this substrate, and, on the other hand, connection wiring for source lines, connection wiring for gate lines, and connection wiring for common electrodes are formed in the field (field used as external surface) of another side.
[0170] Next, while forming a through hole 85 in the predetermined part of the edge of the source line 76 on this substrate, a through hole 86 is formed in the predetermined part of the edge of the gate line 77, and when sticking substrates 74 and 75 on this substrate through a sealant at a back process further, the through hole for common electrodes in which it is located just under a sealant is formed. then, the interior of a through hole 85 -- conductive ingredients, such as a silver paste, -- being filled up -- a hole, while forming an inside connection and making it flow through during each source line 76 of substrate both sides, and connection wiring for source lines electrically An inside connection is formed. the interior of a through hole 86 -- conductive ingredients, such as a silver paste, -- being filled up -- a hole -- it flows through during each gate line 77 of substrate both sides, and connection wiring for gate lines electrically -- making -- the interior of the through hole for common electrodes on the other hand -- conductive ingredients, such as a silver paste, -- being filled up -- a hole -- an inside connection -- forming -- this hole -- it is made to flow through between connection wiring for common electrodes of inside connection and substrate 74 external surface electrically
[0171] Then, the external surface of the component substrate 74 is covered all over abbreviation, resin, such as polyimide and a resist, is applied and hardened, the 1st protective layer is formed, and connection wiring for source lines by the side of external surface, connection wiring for gate lines, and connection wiring for common electrodes are protected.
[0172] On the other hand, transparence substrates, such as a polycarbonate, are prepared as an

ingredient of the opposite substrate 75, and the common electrode 80 is formed in the whole surface (field used as inside) side of a substrate. In case the common electrode 80 is formed here, when sticking substrates 74 and 75 through a sealant at a back process, it forms so that the top face of a sealant and some common electrodes 80 may contact.
[0173] Next, if the orientation film is formed on the inside of the both sides of both substrates, respectively, the component substrate 74 and the opposite substrate 75 will be obtained.
[0174] Subsequently, either substrate of the component substrate 74 and the opposite substrate 75 is arranged on a surface plate, a spacer is sprinkled on this substrate, after printing the resin ingredient used as a sealant, the component substrate 74 and the opposite substrate 75 are piled up and pressurized, lamination and said sealant are stiffened, and an empty cel is produced. In order to make the part of a sealant into the vertical flow section, electric conduction material, such as metal particles, is made to mix into the resin ingredient used as a sealant in the case of the gestalt of this operation. If it does in this way, the common electrode 80 and connection wiring for common electrodes will be electrically connected with a sealant through the connection in a hole.
[0175] Next, liquid crystal is poured in from the liquid crystal inlet of a sealant into an empty cel, and a liquid crystal cell is obtained by closing a liquid crystal inlet. Then, the part on a connection field with IC for a drive is exfoliated among the 1st protective layer formed on connection wiring for source lines, connection wiring for gate lines, and connection wiring for common electrodes. The edge (the 1st linked to electronic parts lengthens about, and it is the terminal area of a current carrying part) of connection wiring for source lines and the edge (the 2nd linked to electronic parts lengthens about, and it is the terminal area of a current carrying part) of connection wiring for gate lines in a connection field with IC for a drive are exposed.
[0176] Subsequently, sequential attachment of a phase contrast plate (illustration abbreviation) and the polarizing plate (illustration abbreviation) is carried out at the external surface side of the opposite substrate 75 of said liquid crystal cell. Then, IC for a drive is mounted in the connection field of IC for a drive formed in the external surface side of the component substrate 74 with gestalten, such as face down mounting and face-up mounting. A liquid crystal display 73 is completed according to the above process.
[0177] Although the gestalt of this operation is the example of manufacture of the active matrix liquid crystal indicating equipment which used the TFT component, the same effectiveness as the example of manufacture of the active matrix liquid crystal indicating equipment of the gestalt of said 5th operation can be acquired also in this case. that is, since the liquid crystal display a liquid crystal display be obtained by the manufacture approach of the gestalt this operation stop need the tooth space which lengthen about to the viewing area exterior of the inside of a component substrate 74, and arrange wiring and can moreover arrange drive circuit formation fields, such as a source line drive circuit required for a TFT active matrix liquid crystal display, and a gate line drive circuit, to the external surface side of a component substrate 74, it attain large narrow picture frame -ization. Moreover, since the external surface side whole region of the component substrate 74 is lengthened about and it can do with the tooth space for wiring, sufficient wiring pitch can be secured, it lengthens about, and increase of resistance is not caused.
[0178] The liquid crystal equipment obtained with the gestalt of implementation of the 7th of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 25 below [the gestalt of the 7th operation].
[0179] The gestalt of this operation as well as the gestalt of the 1st thru/or the 2nd operation is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of a passive matrix mold liquid crystal display, and is the example of manufacture of the liquid crystal display which has the display electrode which served as the light reflex section, and the so-called reflector.
[0180] The 1st, the liquid crystal display obtained with the gestalt of the 2nd operation, and since the outline configuration of the liquid crystal display obtained with the gestalt of this operation is common, it omits illustration and explanation about a common configuration. Drawing 25 is a sectional view corresponding to drawing 7 (sectional view which meets the A-A' line of drawing 6) and drawing 10 (sectional view which meets the A-A' line of drawing 6) which were shown with the gestalt of the 1st operation. In addition, in drawing 25 , the same sign is attached about drawing 7 ,

drawing 10 , and a common component.
[0181] The point that the liquid crystal display 85 obtained with the gestalt of this 7th operation differs from the liquid crystal display obtained with the gestalt of the 1st thru/or the 2nd operation A glass substrate and a glass strengthening plastic plate are used as an ingredient of a bottom substrate. The electrode pad 33 and connection wiring 12 for signal electrodes which embedded IC10 for a drive at crevice 2a beforehand formed in the bottom substrate 2, and were prepared in the front-face side of IC10 for a drive, Carried out bonding of the connection wiring for scan electrodes to the electrode pad 33 with the wire 34. IC10 for a drive is mounted according to the mounting gestalt called the so-called face-up mounting (or OLB (Outer Lead Bonding) mounting). Further IC10 for these drives, They are the connection of this IC10 for a drive, and each connection wiring, and the point that the 1st protective layer 82 was covered by the 2nd protective layer 84.
[0182] The place where the manufacture approach of the liquid crystal display of the gestalt this operation differs from the gestalt of the 1st operation Crevice 2a is beforehand formed in this bottom substrate before mounting of IC for a drive, using a glass substrate and a glass strengthening plastic plate as an ingredient of a bottom substrate, The electrode pad 33 and connection wiring 12 for signal electrodes which embedded IC10 for a drive at the mounting process of IC10 for a drive at crevice 2a beforehand formed in the bottom substrate 2, and were prepared in the front-face side of IC10 for a drive, IC10 for a drive is mounted by carrying out bonding of the connection wiring for scan electrodes to the electrode pad 33 with a wire 34. After mounting of IC10 for a drive further IC10 for a drive, It is the point which forms the 2nd protective layer 84 on the 1st protective layer 82, and carries out flattening of the external surface side of the bottom substrate 2 to the connection of this IC10 for a drive, and each connection wiring.
[0183] By the manufacture approach of the liquid crystal display of the gestalt this operation Since the process which forms the 2nd above protective layer 84 is performed, the connection wiring 12 and 14 by the side of the external surface of the bottom substrate 2 of a liquid crystal display 85 and the connection of IC10 for a drive are protected by the 2nd protective layer 84. Since a blemish can be attached to this connection, it can prevent being polluted and this 2nd protective layer 84 can serve also as an insulation, it becomes easy to deal with the liquid crystal display 85 obtained by this manufacture approach, and is easy to include in electronic equipment. Moreover, since the 2nd protective layer 84 is formed all over the external surface side of the bottom substrate 2, flattening of the external surface side of the bottom substrate 2 is carried out, and the liquid crystal display 85 which is easier to deal with it is obtained.
[0184] Moreover, also in the manufacture approach of the liquid crystal display of the gestalt this operation, the same effectiveness as the gestalt of the 1st thru/or the 2nd operation that the miniaturization by the narrow picture frame can be attained can be acquired.
[0185] In addition, although the case where electronic parts, such as IC for a drive, were mounted in a viewing area by the appearance of a bottom substrate (the 1st substrate) was explained in the gestalt of the 1st - the 7th operation Although a viewing area becomes small compared with the case where may mount said electronic parts in the non-display field of the external surface of the 1st substrate, and it mounts in a viewing area in that case, it can avoid having a bad influence on a viewing area with the heat at the time of mounting, and the prevention effectiveness of generating, such as display nonuniformity, is excellent.
[0186] The liquid crystal equipment obtained with the gestalt of implementation of the 8th of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 26 - drawing 30 below [the gestalt of the 8th operation].
[0187] The gestalt of this operation is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of the same passive matrix mold liquid crystal display as the gestalt of the 1st operation, and is the example of manufacture of a transparency mold liquid crystal display.
[0188] The transparency top view showing the condition that the transparency flat-surface side and drawing 29 as which the perspective view which looked at the whole liquid crystal display with which drawing 26 was obtained with the gestalt of this operation from the top-face side, the perspective view which drawing 27 looked at from the inferior-surface-of-tongue side, and drawing 28 regarded the bottom substrate from the inferior-surface-of-tongue side piled up the top substrate

and the bottom substrate, the sectional view where drawing 30 meets the A-A' line of drawing 29 , and drawing 31 are the sectional views which meet the B-B' line of drawing 29 .
[0189] Illustration and explanation are omitted about the liquid crystal display obtained with the gestalt of operation of the 1st of the liquid crystal display obtained with the gestalt of this operation, and a common configuration. In addition, in drawing 26 - drawing 30 , the same sign is attached about the liquid crystal equipment obtained with the gestalt of the 1st operation, and a common component.
[0190] The point that the liquid crystal display 91 obtained with the gestalt of this operation differs from the liquid crystal display obtained with the gestalt of the 1st operation In the liquid crystal display 1 obtained with the gestalt of the 1st operation Since it is a reflective mold liquid crystal display, a transparence substrate is used as an ingredient of the top substrate 3 at least among the bottom substrate 2 and the top substrate 3. Moreover, object[for signal electrodes]-****** and wiring 11 and the scan electrode 7 which object[for the scanning lines]-****** and is formed in the top substrate 3 at least among wiring 13 consist of a signal electrode 6 formed in the bottom substrates 2 and 3, a scan electrode 7, and an electrical conducting material which has translucency. With the liquid crystal display 91 obtained with the gestalt of this 8th operation, to the 1st protective layer 82 formed on the bottom substrate 2 being opaque, and the signal electrode 6 serving as a reflecting layer Since it is a transparency mold liquid crystal display, the transparence substrate which consists of glass etc. as an ingredient of the bottom substrate 2 (the 1st substrate) by which opposite arrangement was carried out, and the top substrate 3 (the 2nd substrate) is used. Object[for signal electrodes]-******, and object[for the scanning lines]-****** and wiring 13 consists of wiring 11 and an electrical conducting material which all has translucency. the signal electrode 6 formed in the bottom substrates 2 and 3, and the scan electrode 7 -- Moreover, the 1st protective layer 82 formed on the bottom substrate 2 has translucency, and the signal electrode 6 does not serve as the reflecting layer.
[0191] moreover, in the liquid crystal display 1 obtained with the gestalt of the 1st operation IC10 for a drive is mounted on the external surface of the bottom substrate 2 by connecting with each edge of the wiring 41 for a signal input prepared on the external surface of the bottom substrate 2, the connection wiring 12 for signal electrodes, and the connection wiring 14 for the scanning lines. The other end of the signal input wiring 41 is connected to the external connection terminal 26 formed in the external surface side periphery section of the bottom substrate 2. Moreover, it receives that the 1st protective layer 82 is formed on the external surface of bottom substrates 2 on the external connection terminal 26 and other than on [of IC10 for a drive] a connection field. In the liquid crystal display 91 obtained with the gestalt of this operation The external connection terminal 26 is connected to each edge of the connection wiring 12 for signal electrodes, and the connection wiring 14 for the scanning lines which the wiring 41 for a signal input was not formed on the external surface of the bottom substrate 2, but was prepared on the external surface of the bottom substrate 2. By connecting COF47 which carried IC10 grade for a drive in this external connection terminal 26, IC10 for a drive is mounted in the way outside the bottom substrate 10, and the 1st protective layer 82 is a point established on the external surface of bottom substrates 2 other than on the external connection terminal 26.
[0192] moreover, in the liquid crystal display 1 obtained with the gestalt of the 1st operation With the liquid crystal display 91 obtained with the gestalt of this operation, the phase contrast plate 4 to being arranged between a polarizing plate 5 and the top substrate 3 It is the point that a phase contrast plate is not arranged between a polarizing plate 5 and the top substrate 3, but polarizing plate 5a is arranged also at the external surface side of the bottom substrate 2, and the back light 88 (lighting means) is attached in the way outside this polarizing plate 5a.
[0193] In addition, in the drawing after drawing 27 , illustration of polarizing plates 5 and 5a and a back light 88 is omitted.
[0194] Moreover, although pulled out by the field on the right-hand side of the signal electrode [in / the case of the gestalt of this operation / in all connection wiring 18 for signal electrodes / drawing 29] 6, it may distribute to right-hand side and left-hand side, and you may pull out, and the direction of a drawer of connection wiring is arbitrary, and it is good.
[0195] moreover, in the liquid crystal display 91 obtained with the gestalt of this operation As shown

in drawing 28 , on the external surface of the bottom substrate 2 The through hole of the connection wiring 18 for signal electrodes, Corresponding to the location of the through hole of the connection wiring 21 for scan electrodes, the circular lands 24 and 25 are formed, respectively. The connection wiring 12 for signal electrodes is formed, respectively from each land 24 corresponding to the through hole of the connection wiring 18 for signal electrodes, and the connection wiring 14 for scan electrodes is formed from each land 25 corresponding to the through hole of the connection wiring 21 for scan electrodes.

[0196] Along with two sides, the lands 24 and 25 of above-mentioned a large number are arranged among four sides of the periphery section of the bottom substrate 2, and many external connection terminals 26 are formed along with the side where the land 25 was arranged, and one side which counters. Each of these external connection terminal 26 is connected with the connection wiring 12 for signal electrodes, or the connection wiring 14 for scan electrodes.

[0197] the picture signal inputted from the external connection terminal 26 in this transparency mold liquid crystal display 91 as shown in drawing 30 -- the connection wiring 12 for signal electrodes on the external surface of the bottom substrate 2, and a hole -- each signal electrode 6 is supplied via the connection wiring 18 for signal electrodes on the inside of the inside connection 15 and the bottom substrate 2.

[0198] Ranging from the inside to external surface of the bottom substrate 2, it object[for scan electrodes]-****** hereafter, and the configuration of wiring 13 is object[for signal electrodes]-******(ed), and is the same as that of the case of wiring 11. the scan signal inputted from the external connection terminal 26 in this transparency mold liquid crystal display 91 -- the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2, and a hole -- each scan electrode 7 is supplied via the connection wiring 21 for scan electrodes on the inside of the inside connection 20 and the bottom substrate 2, and the vertical flow section 19.

[0199] Hereafter, the gestalt of the operation which applied the manufacture approach of the liquid crystal display of this invention to the manufacture approach of the transparency mold liquid crystal display of the aforementioned configuration is explained.

[0200] After preparing transparence substrates, such as a glass substrate, as an ingredient of the bottom substrate 2 and forming translucency electric conduction film, such as ITO, to front flesh-side both sides of a substrate, the signal electrode 6 by the side of above-mentioned bottom substrate 2 inside, each connection wiring 18 and 21, the connection wiring 12 for signal electrodes by the side of external surface, and the connection wiring 14 grade for scan electrodes are collectively formed by performing patterning of the translucency electric conduction film of these both sides to coincidence.

[0201] Next, the through holes 17 and 38 which penetrate a substrate by chemical etching, laser processing, etc. in the predetermined part of each connection wiring edge on the bottom substrate 2 are formed. then, the approach of filling up the interior of through holes 17 and 38 with a conductive ingredient etc. -- a hole -- the inside connections 15 and 20 are formed and it is made to flow through between each connection wiring of bottom substrate 2 both sides electrically Then, it is desirable to continue all over the abbreviation for the external surface of the bottom substrate 2, to apply and harden resin, such as polyimide and a resist, to form the 1st protective layer 82, and to protect various connection wiring by the side of external surface.

[0202] On the other hand, transparence substrates, such as a glass substrate, are prepared as an ingredient of the top substrate 3, after forming translucency electric conduction film, such as ITO, patterning is carried out and the scan electrode 7 is formed in the whole surface (field used as inside) side of a substrate.

[0203] Next, the orientation film 35 and 36 is formed on the inside of bottom substrate 2 and top substrate 3 both sides, respectively.

[0204] Subsequently, either substrate of these bottom substrate 2 and the top substrate 3 is arranged on a surface plate, a spacer 37 is sprinkled on this substrate, after printing sealant 27 ingredient which made electric conduction material mix into a resin ingredient, lamination and a sealant 27 are stiffened for the bottom substrate 2 and the top substrate 3, and an empty cel is produced.

[0205] Next, liquid crystal, such as a chiral nematic liquid crystal used for STN mode etc. from the liquid crystal inlet of a sealant, is poured in into an empty cel, and a liquid crystal cell is produced by

closing a liquid crystal inlet.
[0206] Then, the part formed on the external connection terminal 26 among the 1st protective layer 82 formed on the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, and the wiring 41 for a signal input is exfoliated, and the external connection terminal 26 is exposed.
[0207] Moreover, in order to connect with a panel inspection machine and to investigate the property (panel property) of a liquid crystal cell, it is desirable for the 1st protective layer 82 other than the aforementioned part to also exfoliate partially, to expose wiring etc. partially, to connect a panel inspection machine to these outcrops, to evaluate the quality of a panel property, and to use for a back process only what passed.
[0208] Subsequently, after sticking polarizing plate 5a on the external surface side of the top substrate 3 of a liquid crystal cell with which the panel property passed at the external surface side of polarizing plate 5a and the bottom substrate 2, respectively, a back light 88 is attached in the external surface side of the bottom substrate 2.
[0209] Then, COF47 which carried IC(electronic parts) 10 grade for a drive in the external connection terminal 26 prepared in the external surface side periphery section of the bottom substrate 2 is connected, and IC10 for a drive (electronic parts) is mounted in a way outside the bottom substrate 2. According to the above process, the transparency mold liquid crystal display 91 of the gestalt of this operation is completed.
[0210] By the manufacture approach of the liquid crystal display of the gestalt the 8th operation The signal electrode 6 was formed covering the external surface of the bottom substrate 2 through the interior of a substrate from the inside of the bottom substrate 2, object[for signal electrodes]-****** it, and it has connected with wiring 11. On the other hand, between substrates is crossed for the scan electrode 7 from the inside of the top substrate 3. To the inside of the bottom substrate 2 Furthermore, were prepared covering the external surface of the bottom substrate 2 through the interior of a substrate from the inside of the bottom substrate 2, and since it object[for scan electrodes]-****** and has connected with wiring 13 electrically the object for signal electrodes -- ******(ing) -- wiring 11 and the object for scan electrodes -- ******(ing) -- the both sides of wiring 13 -- the bottom substrate 2 and the top substrate 3 -- the liquid crystal display lengthened about through the interior of the bottom substrate 2 at the external surface side of the bottom substrate 2 is obtained from each inside.
[0211] Moreover, since the external connection terminal 26 which lengthened about in the periphery section of bottom substrate 2 external surface, and was connected with wiring 11 and 13 is formed, when it mounts COF, COF in which IC for a drive was carried, alignment at the time of connecting the external connection terminal 26 and the terminal of COF can be performed easily. Moreover, although stress may occur in a part for a joint the time of COF junction, or after junction, if the location is the substrate periphery section from which it separated from the viewing area 9, said stress will not have a bad influence on a display.
[0212] The liquid crystal equipment obtained with the gestalt of implementation of the 9th of the manufacture approach of the liquid crystal equipment of this invention is explained with reference to drawing 32 and drawing 33 below [the gestalt of the 9th operation].
[0213] The gestalt of this operation as well as the gestalt of the 8th operation is the example which applied the manufacture approach of the liquid crystal equipment of this invention to the manufacture approach of a passive matrix mold liquid crystal display, and is the example of manufacture of a transparency mold liquid crystal display. The liquid crystal display 91 which manufactured a different point from the liquid crystal display obtained with the gestalt of the 8th operation with the gestalt of the 8th operation is the point that COG mounting was adopted to having adopted COF mounting as a mounting gestalt of IC for a drive with the liquid crystal display 92 manufactured with the gestalt of this operation.
[0214] Thus, the liquid crystal display 91 obtained with the gestalt of the 8th operation, and since the outline configuration of the liquid crystal display 92 obtained with the gestalt of this operation is common, it omits illustration and explanation about a common configuration. Drawing 32 is drawing corresponding to drawing 27 shown with the gestalt of the 8th operation, and the perspective view which looked at the whole liquid crystal display obtained with the gestalt of this operation from the

inferior-surface-of-tongue side, and drawing 33 are sectional views which meet the B-B' line of drawing 32 . In addition, in these drawings, the same sign is attached about drawing 26 - drawing 31 , and a common component.

[0215] In the case of the liquid crystal display 91 obtained with the gestalt of the 8th operation, on the external surface of a bottom substrate, the external connection terminal 26 connected with the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, and these connection wiring 12 and 14 is formed. Although COF47 by which IC10 for a drive was carried in this external connection terminal 26 was connected and IC10 for a drive was mounted in the way outside the bottom substrate 2 In the case of the liquid crystal display 92 obtained with the gestalt of this operation, as shown in drawing 32 The external connection terminal 26 connected with the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, the wiring 41 for a signal input, and the signal input wiring 41 is formed on the external surface of the bottom substrate 2. IC10 for a drive is connected to each edge of the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, and the wiring 41 for a signal input, and IC10 for a drive is mounted in the external surface side of the bottom substrate 2.

[0216] moreover, in the liquid crystal display 91 obtained with the gestalt of the 8th operation With the liquid crystal display 92 obtained with the gestalt of this operation, the 1st protective layer 82 to being prepared on the external surface of bottom substrates 2 other than on the external connection terminal 26 The 1st protective layer 82 is a point established on the external surface of bottom substrates 2 on the external connection terminal 26 and the connection field of IC10 for a drive, and other than on the wiring 41 for a signal input.

[0217] In the case of the liquid crystal display 92 obtained with the gestalt of this operation, connection wiring for signal electrodes on the inside of a bottom substrate is pulled out by the field of the opposite side by turns in the adjoining signal electrode like the left-hand side of a signal electrode 6, right-hand side, left-hand side, and --. And two or more lands 24 corresponding to the through hole of connection wiring for signal electrodes are formed along with two sides which counter among four sides of the periphery section of the bottom substrate 2, and the connection wiring 12 for signal electrodes is formed towards the mounting field of IC10 for a drive, respectively from these lands 24. Moreover, each land 25 corresponding to the through hole of connection wiring for scan electrodes is formed along with one side of the periphery section of the bottom substrate 2, and the connection wiring 14 for scan electrodes is formed towards the mounting field of IC10 for a drive from these lands 25.

[0218] Since the liquid crystal display 92 obtained with the gestalt of this operation is a transparency mold liquid crystal display, IC10 for a drive cannot be arranged in a viewing area 9, but the one-side side of the bottom substrate 2 is prolonged on the outside of the top substrate 3, i.e., a non-display field, and IC10 for a drive is mounted in this part.

[0219] Drawing 33 is the sectional view which cut the liquid crystal display 92 obtained with the gestalt of this operation in the direction which met the scan electrode 7, it object[for scan electrodes]-****** and the configuration of wiring 13 is shown. As shown in this drawing, the scan electrode 7 is formed on the inside of the top substrate 3 so that the top face of a sealant 27 where electric conduction material, such as metal particles, was mixed in the interior into binders, such as resin, may be contacted. Moreover, on the inside of the bottom substrate 2, while many signal electrodes 6 are formed, the connection wiring 21 for scan electrodes is formed so that the inferior surface of tongue of a sealant 27 may be contacted.

[0220] Here, the scan electrode 7 and the connection wiring 21 for scan electrodes which contacted, respectively are electrically connected to the top face and inferior surface of tongue of a sealant 27 where electric conduction material was mixed, and the vertical flow section 19 is constituted.

[0221] The connection wiring 14 for scan electrodes is formed on the external surface of the bottom substrate 2, and the through hole 38 is formed in the part of the lands 23 and 25 at the tip of the connection wiring 21 and 14 for scan electrodes by the side of [both] an inside and external surface. The interior of a through hole 38 was filled up with conductive ingredients, such as a silver paste, and this conductive ingredient constituted the connection 20 in a hole, and has connected mutually the connection wiring 21 and 14 for scan electrodes by the side of an inside and external surface electrically.

[0222] Moreover, the terminal 32 of IC10 for a drive is connected to the edge of the opposite side the side in which the through hole 38 of the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2 was established. the scan signal outputted from IC10 for a drive by taking the above wiring structures -- the connection wiring 14 for scan electrodes on the external surface of the bottom substrate 2, and a hole -- each scan electrode 7 is supplied via the connection wiring 21 for scan electrodes on the inside of the inside connection 20 and the bottom substrate 2, and the vertical flow section 19. therefore, the connection wiring 14 for scan electrodes on the external surface of these bottom substrate 2 and a hole -- the connection wiring 21 for scan electrodes on the inside of the inside connection 20 and the bottom substrate 2 and the vertical flow section 19 will object[for scan electrodes]-******, and will constitute wiring 13.
[0223] the picture signal which is not illustrated and with which it object[for signal electrodes]-******(ed), and the same was said of the configuration of wiring with the picture signal and it was outputted from IC10 for a drive -- the connection wiring 12 for signal electrodes on the external surface of the bottom substrate 2, and a hole -- each signal electrode 6 is supplied via connection wiring for signal electrodes on the inside of an inside connection and the bottom substrate 2. therefore, the connection wiring 12 for signal electrodes on the external surface of these bottom substrate 2 and a hole -- connection wiring for signal electrodes on the inside of an inside connection and the bottom substrate 2 will object[for signal electrodes]-******, and will constitute wiring.
[0224] The place where the manufacture approach of the liquid crystal display of the gestalt the 9th operation differs from the gestalt of the 8th operation With the gestalt of the 8th operation, the external connection terminal 26 connected with the signal electrode 6 by the side of bottom substrate 2 inside, each connection wiring 18 and 21, the connection wiring 12 for signal electrodes by the side of external surface, the connection wiring 14 for scan electrodes, and these connection wiring 12 and 14 is formed collectively. Moreover, when exfoliating partially the 1st protective layer 82 formed in the bottom substrate 2, As opposed to having exfoliated the part formed on the external connection terminal 26 With the gestalt of the 9th operation, the signal electrode 6 by the side of bottom substrate 2 inside, each connection wiring 18 and 21, the connection wiring 12 for signal electrodes by the side of external surface, the connection wiring 14 for scan electrodes, the connection wiring 41 for a signal input, and the external connection terminal 26 connected with this are formed collectively. Moreover, in case the 1st protective layer 82 formed in the bottom substrate 2 is exfoliated partially, it is the point of having exfoliated the part formed on the external connection terminal 26, the connection field of IC10 for a drive, and the wiring 41 for a signal input.
[0225] Moreover, it is the point which mounts by face down mounting etc. in IC 10 for a drive at the gestalt of the 9th operation on each edge of the connection wiring 12 for signal electrodes, the connection wiring 14 for scan electrodes, and the connection wiring 41 for a signal input to connecting to the external connection terminal 26 COF47 which carried IC10 grade for a drive with the gestalt of the 8th operation, and mounting IC10 for a drive in a way outside the bottom substrate 2.
[0226] In the manufacture approach of the liquid crystal display of the gestalt this operation Since the one-side side of the bottom substrate 2 is made to extend on the outside of the top substrate 3 and IC10 for a drive is mounted in the part Although the part which prepared the field which mounts IC10 for a drive, and the frame part of a liquid crystal display become large a little, it becomes unnecessary to connect COF which carried IC for a drive, and reduction of the components for connection can be aimed at.
[0227] Moreover, although a viewing area becomes small compared with the case where it mounts in a viewing area by having mounted IC10 for a drive in the non-display field, it can avoid having a bad influence on a viewing area with the heat at the time of mounting, and the prevention effectiveness of generating, such as display nonuniformity, is excellent. Moreover, if the mounting position of IC for a drive is a non-display field although irregularity may arise in a bottom substrate with the heat at the time of mounting of IC10 for a drive when the bottom substrate 2 is a transparence substrate which has flexibility, it can avoid that said irregularity has a bad influence on a display, and display quality can manufacture a good liquid crystal display.
[0228] [Electronic equipment] The example of electronic equipment equipped with the liquid crystal display obtained by the manufacture approach of the gestalt one of the aforementioned operations is

explained.
[0229] Drawing 34 is the perspective view having shown an example of a cellular phone. In drawing 34 , a sign 1000 shows the body of a cellular phone, and the sign 1001 shows the liquid crystal display section using the liquid crystal display obtained by the manufacture approach of the gestalt one of the aforementioned operations.
[0230] Drawing 35 is the perspective view having shown an example of wrist watch mold electronic equipment. In drawing 35 , a sign 1100 shows the body of a clock and the sign 1101 shows the liquid crystal display section using the liquid crystal display obtained by the manufacture approach of the gestalt one of the aforementioned operations.
[0231] Drawing 36 is the perspective view having shown an example of pocket mold information processors, such as a word processor and a personal computer. In drawing 36 , the liquid crystal display section using the liquid crystal display from which the sign 1200 was obtained with the information processor and the sign 1202 was obtained by the manufacture approach of the gestalt one operation of the above [the input sections such as a keyboard, and a sign 1204 / the body of an information processor and a sign 1206] is shown.
[0232] Since the electronic equipment shown in drawing 33 - drawing 36 is equipped with the liquid crystal display section using the liquid crystal display obtained with the gestalt of one of the aforementioned operations, by having had the small liquid crystal panel by narrow-picture-frame-izing, a viewing area is comparatively large and it can realize electronic equipment excellent in portability with the whole small equipment.
[0233] In addition, the technical range of this invention can add various modification in the range which is not limited to the gestalt of said operation and does not deviate from the meaning of this invention. For example, the 1st, the example of manufacture from which the formation location of a through hole differs in the passive matrix mold liquid crystal display which has a reflector with the gestalt of the 2nd operation, The example of manufacture of the liquid crystal display equipped with the color filter with the gestalt of the 3rd operation, Although the example of manufacture of the liquid crystal display which has a reflecting layer and a display electrode separately with the gestalt of the 4th operation, and the gestalt of the 5th operation explained the example of manufacture of a TFT active matrix liquid crystal indicating equipment, respectively with the example of manufacture of a TFD active matrix liquid crystal indicating equipment, and the gestalt of the 6th operation The focus of the gestalt of these operations may be combined suitably.
[0234] Moreover, of course about the concrete publication of the manufacture approach illustrated with the gestalt of said operation, the component of each liquid crystal display manufactured with the gestalt of operation, a configuration, etc., etc., it can change suitably. Moreover, the manufacture approach of the liquid crystal equipment of this invention is also applicable to the manufacture approach of the liquid crystal light valve of not only a direct viewing type but projection mold liquid crystal equipment (projector).
[0235]
[Effect of the Invention] As mentioned above, as explained to the detail, it sets to the manufacture approach of the liquid crystal equipment of this invention. Since the 1st and the 2nd lengthen about, a current carrying part lengthens about from the inside side of the 1st substrate to an external surface side through the interior of a substrate and electronic parts are further mounted in a way or external surface side outside said 1st substrate with the liquid crystal equipment manufactured by the manufacture approach of this invention, it had prepared in the viewing-area outside of the 1st substrate inside in the configuration of conventional liquid crystal equipment -- since it lengthens about and a field becomes unnecessary, only the part can narrow a frame part sharply compared with conventional liquid crystal equipment. Moreover, since it lengthens about all over the external surface side of the 1st substrate including the inside of a viewing area, and a current carrying part can be arranged, it lengthens about and the pitch between current carrying parts can be designed with allowances, the problem that lengthen about and resistance increases does not arise. Moreover, it can lengthen about in this way, generating of a cross talk can be improved by low resistance-ization of a current carrying part, and display grace can be improved.
[0236] Moreover, since it lengthens about as mentioned above and a current carrying part can be arranged all over the external surface side of the 1st substrate even if it lengthens about with the

increment in display capacity and makes [many] the number of a current carrying part Compared with the conventional liquid crystal equipment which lengthened about and had established the field in the viewing-area outside of the 1st substrate inside, it lengthens about, and the line breadth and the pitch of a current carrying part can be designed with allowances, and it lengthens about, and is hard to generate defects, such as an open circuit of a current carrying part.

[0237] While constitutes liquid crystal equipment itself, and the 1st substrate of the liquid crystal equipment manufactured by the manufacture approach of this invention functions also as a loading substrate of a drive circuit at the same time it functions as a substrate. Therefore, depending on the case, reduction of components for connection, such as a flexible tape, can also be aimed at, and the miniaturization of the cost cut by reduction of the number of components and liquid crystal equipment is still more possible. Moreover, since the liquid crystal equipment with which electronic parts were mounted in the external surface side of the 1st substrate can also be obtained and FPC connected with electronic parts or this an end face and around the 1st which counters, and the 2nd substrate is not attached, in case it attaches in electronic equipment compared with what was made to jut out a substrate more greatly than the substrate of another side, and carried out COF mounting and the thing which carried out COG mounting like the conventional liquid crystal display, it is easy to deal with it.

[0238] Furthermore, since the 1st and the 2nd substrate with which it lengthened about with each current carrying part, and the current carrying part was formed are stuck through a sealant by the manufacture approach of this invention before mounting electronic parts in the external surface side of the 1st substrate If it is made to mount electronic parts only in what the 1st, the 1st of the 2nd substrate, and the 2nd lengthened about, connected the panel inspection machine with the current carrying part, evaluated the quality of a panel property, and passed before the mounting process of electronic parts, it can be managed even if it does not mount electronic parts in a defect's liquid crystal panel, and reduction of cost is possible.

[0239] Moreover, since the liquid crystal equipment manufactured by this invention as mentioned above can be miniaturized, a miniaturization and low-pricing of electronic equipment are realizable.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view which looked at the whole liquid crystal display manufactured with the gestalt of implementation of the 1st of the manufacture approach of the liquid crystal equipment of this invention from the top-face side.
[Drawing 2] It is the perspective view which looked at the **** liquid crystal display from the inferior-surface-of-tongue side.
[Drawing 3] It is the top-face (electrode forming face) Fig. of the bottom substrate which constitutes a **** liquid crystal display.
[Drawing 4] It is the transparency top view which looked at the **** bottom substrate from the inferior-surface-of-tongue side.
[Drawing 5] It is the inferior-surface-of-tongue (electrode forming face) Fig. of the top substrate which constitutes a **** liquid crystal display.
[Drawing 6] It is the transparency top view showing the condition of having piled up the **** top substrate and the bottom substrate.
[Drawing 7] It is drawing showing the cross-section structure of a **** liquid crystal display, and is the sectional view which meets the A-A' line of drawing 6 .
[Drawing 8] It is the sectional view which meets the B-B' line of **** drawing 6 .
[Drawing 9] It is the sectional view showing other examples of the vertical flow section of a **** liquid crystal display.
[Drawing 10] It is the sectional view showing other examples of the mounting gestalt of IC for a drive of a **** liquid crystal display.
[Drawing 11] It is drawing showing the example of the connection in a hole of a **** bottom substrate.
[Drawing 12] It is drawing showing other examples of the connection in ******.
[Drawing 13] It is drawing showing the example of further others of the connection in ******.
[Drawing 14] In the liquid crystal display manufactured with the gestalt of implementation of the 2nd of the manufacture approach of the liquid crystal equipment of this invention, it is the perspective drawing showing the condition of having piled up the top substrate and the bottom substrate.
[Drawing 15] It is drawing showing the cross-section structure of a **** liquid crystal display, and is the sectional view which meets the A-A' line of drawing 14 .
[Drawing 16] It is the sectional view which meets the B-B' line of **** drawing 14 .
[Drawing 17] It is drawing showing the cross-section structure of the liquid crystal display manufactured with the gestalt of implementation of the 3rd of the manufacture approach of the liquid crystal equipment of this invention, and is a sectional view equivalent to the A-A' line of drawing 6 .
[Drawing 18] It is drawing showing the cross-section structure of a **** liquid crystal display, and is a sectional view equivalent to the B-B' line of drawing 6 .
[Drawing 19] It is drawing showing the cross-section structure of the liquid crystal display manufactured with the gestalt of implementation of the 4th of the manufacture approach of the liquid crystal equipment of this invention, and is a sectional view equivalent to the A-A' line of drawing 6 .
[Drawing 20] It is drawing showing the cross-section structure of a **** liquid crystal display, and is a sectional view equivalent to the B-B' line of drawing 6 .

[Drawing 21] In the gestalt of this operation, it is the sectional view equivalent to the A-A' line of drawing 6 showing other examples of the connection structure of a signal electrode and connection wiring for signal electrodes.
[Drawing 22] the perspective view which is drawing showing the liquid crystal display manufactured with the gestalt of implementation of the 5th of the manufacture approach of the liquid crystal equipment of this invention, and looked at the whole (a) from the top-face side, and (b) -- it is a 1-pixel enlarged drawing.
[Drawing 23] the perspective view which is drawing showing the liquid crystal display manufactured with the gestalt of implementation of the 6th of the manufacture approach of the liquid crystal equipment of this invention, and looked at the whole (a) from the top-face side, and (b) -- it is a 1-pixel enlarged drawing.
[Drawing 24] It is drawing showing the gestalt of implementation of the 1st of the manufacture approach of the liquid crystal equipment of this invention in order of a process, and they are the sectional view of the top substrate which met in the direction which intersects (a) scan electrode, the sectional view of the bottom substrate of the direction which met the (b) signal electrode, and the sectional view showing the liquid crystal cell before mounting of (c) electronic parts.
[Drawing 25] It is drawing showing the cross-section structure of the liquid crystal display manufactured with the gestalt of implementation of the 7th of the manufacture approach of the liquid crystal equipment of this invention, and is a sectional view equivalent to the A-A' line of drawing 6 .
[Drawing 26] It is the perspective view which looked at the whole liquid crystal display manufactured with the gestalt of implementation of the 8th of the manufacture approach of the liquid crystal equipment of this invention from the top-face side.
[Drawing 27] It is the perspective view which looked at the **** liquid crystal display from the inferior-surface-of-tongue side.
[Drawing 28] It is the transparency top view which looked at the **** bottom substrate from the inferior-surface-of-tongue side.
[Drawing 29] It is the transparency top view showing the condition of having piled up the **** top substrate and the bottom substrate.
[Drawing 30] It is drawing showing the cross-section structure of a **** liquid crystal display, and is the sectional view which meets the A-A' line of drawing 29 .
[Drawing 31] It is the sectional view which meets the B-B' line of **** drawing 29 .
[Drawing 32] It is the perspective view which looked at the whole liquid crystal display obtained with the gestalt of implementation of the 9th of the manufacture approach of the liquid crystal equipment of this invention from the inferior-surface-of-tongue side.
[Drawing 33] It is the sectional view which meets the B-B' line of **** drawing 32 .
[Drawing 34] It is the perspective view showing an example of the electronic equipment of this invention.
[Drawing 35] It is the perspective view showing other examples of the electronic equipment of this invention.
[Drawing 36] It is the perspective view showing the example of further others of the electronic equipment of this invention.
[Drawing 37] It is the perspective view showing an example of the conventional liquid crystal equipment which applied COF mounting.
[Drawing 38] It is the perspective view showing an example of the conventional liquid crystal equipment which applied COG mounting.
[Drawing 39] It is the top view showing the configuration of the top substrate in conventional passive matrix mold liquid crystal equipment.
[Drawing 40] It is the top view showing the configuration of a **** bottom substrate.
[Description of Notations]
1, 50, 52, 58, 61, 73, 85, 91, 92 Liquid crystal display (liquid crystal equipment)
2 Bottom Substrate (1st Substrate)
2a Crevice
3 Top Substrate (2nd Substrate)
5 Polarizing Plate (Polarization Means)

6 Signal Electrode (1st Current Carrying Part)
7 Scan Electrode (2nd Current Carrying Part)
10 32 IC for a drive (electronic parts)
11 ****** Object for Signal Electrodes and Wire (the 1st Lengthening about Current Carrying Part).

12 Connection Wiring for Signal Electrodes (1st External Surface Top Connection)
13 ****** Object for Scan Electrodes and Wire (the 2nd Lengthening about Current Carrying Part).
14 Connection Wiring for Scan Electrodes (the 2nd Lengthening about 2nd External Surface Top Connection and a Part of 1st Part of Current Carrying Part)
15, 30, 44, and 46 a hole -- inside connection (the 1st hole inside connection)
17 38 Through hole
18 Connection Wiring for Signal Electrodes
19, 39, 40 Vertical flow section (the 2nd lengthening about the connection between substrates, the 2nd part of a current carrying part)
20 Hole -- Inside Connection (2nd Hole Inside Connection and the 2nd Lengthening about a Part of 1st Part of Current Carrying Part)
21 Connection Wiring for Scan Electrodes (2nd Inside Top Connection)
26 External Connection Terminal
27 Sealant
28 Liquid Crystal Layer
42 Internal Conductive Layer
43 45 Beer hall
54 Color Filter
59 Reflecting Layer
62 74 Component substrate (the 1st substrate)
63 75 Opposite substrate (the 2nd substrate)
64 Data Line (1st Current Carrying Part)
66 TFD Component
67 Scanning Line (2nd Current Carrying Part)
76 Source Line (Data Line, 1st Current Carrying Part)
77 Gate Line (Scanning Line, 1st Current Carrying Part)
78 TFT Component
80 Common Electrode (2nd Current Carrying Part)
82 1st Protective Layer
84 2nd Protective Layer

[Translation done.]

* NOTICES *

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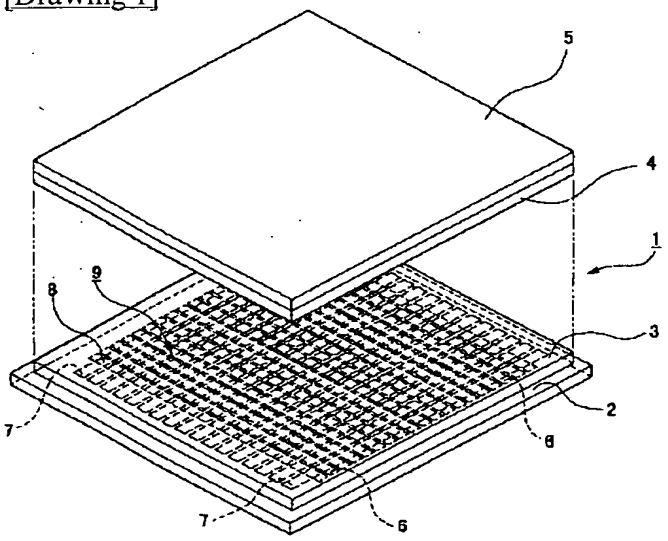
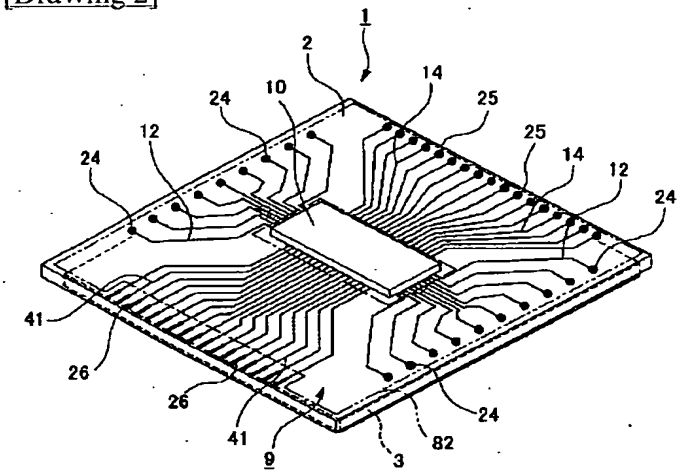
DRAWINGS

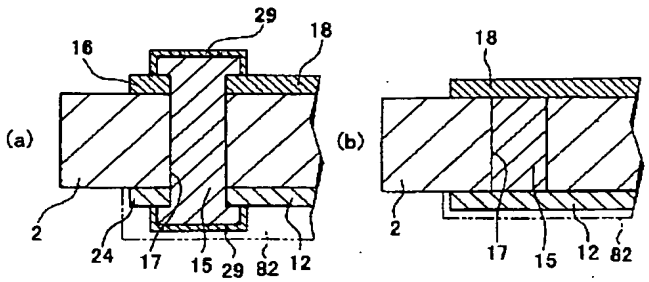
[Drawing 1]



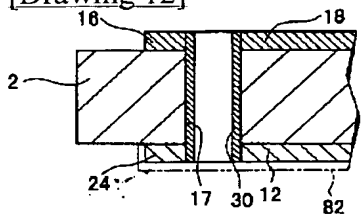
[Drawing 2]



[Drawing 11]



[Drawing 12]



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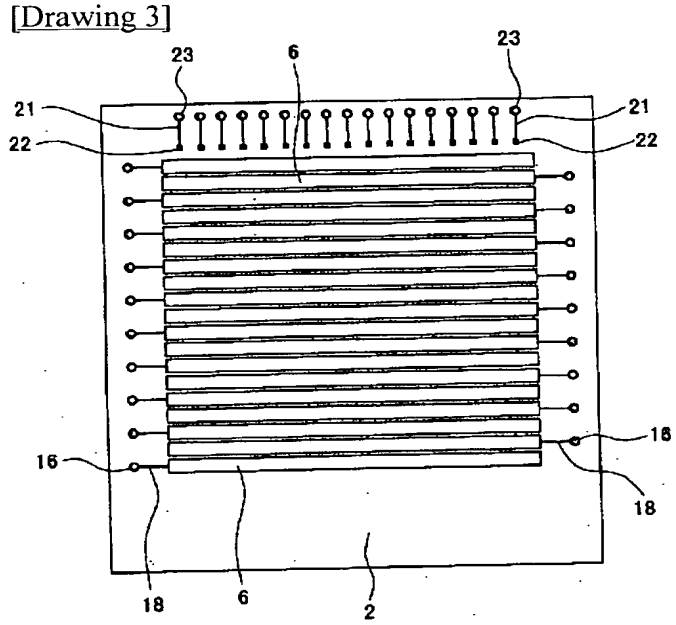

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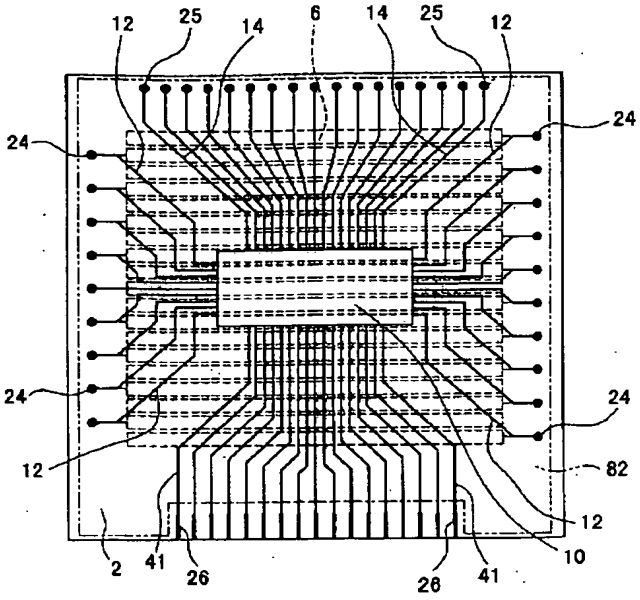
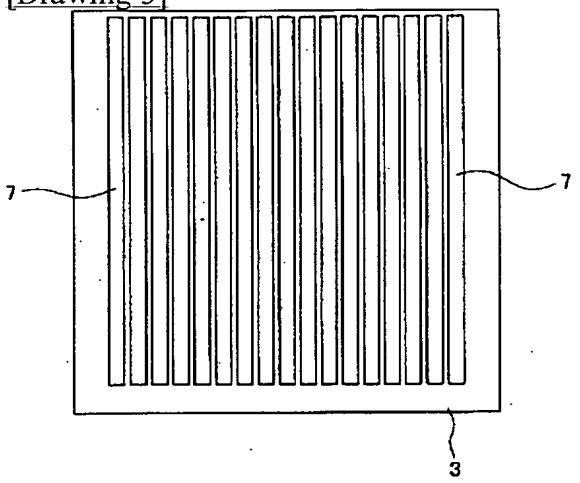
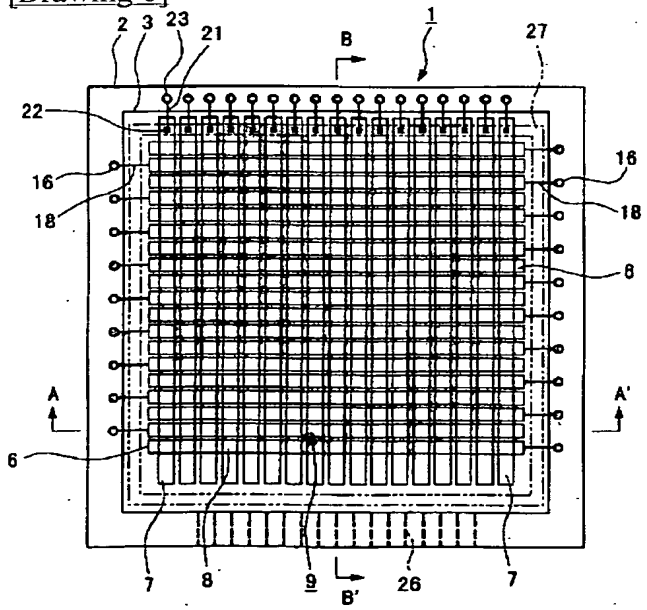


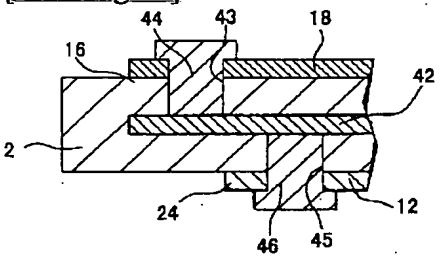
[Drawing 5]



[Drawing 6]



[Drawing 13]



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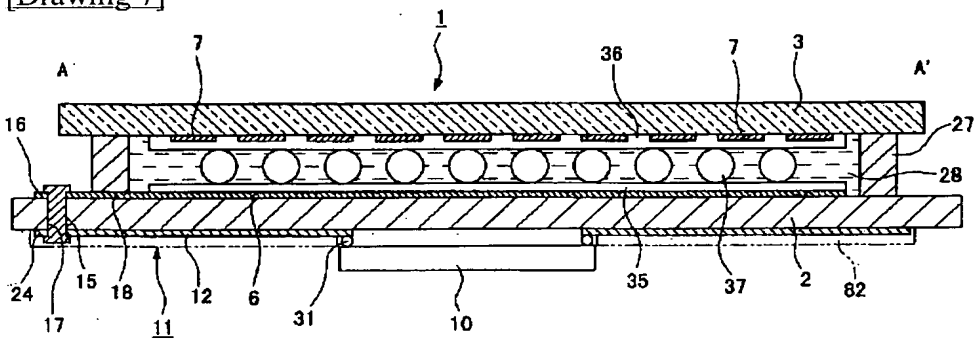

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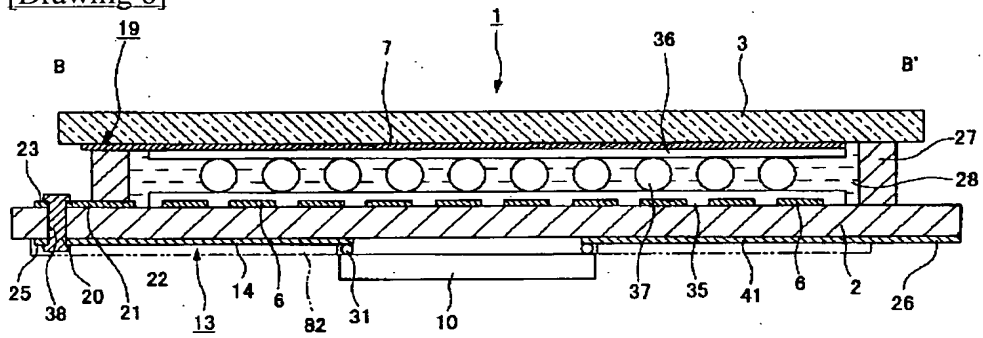

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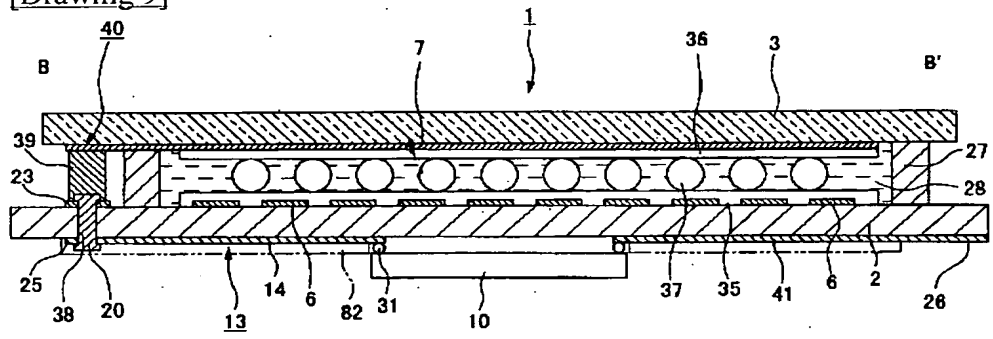

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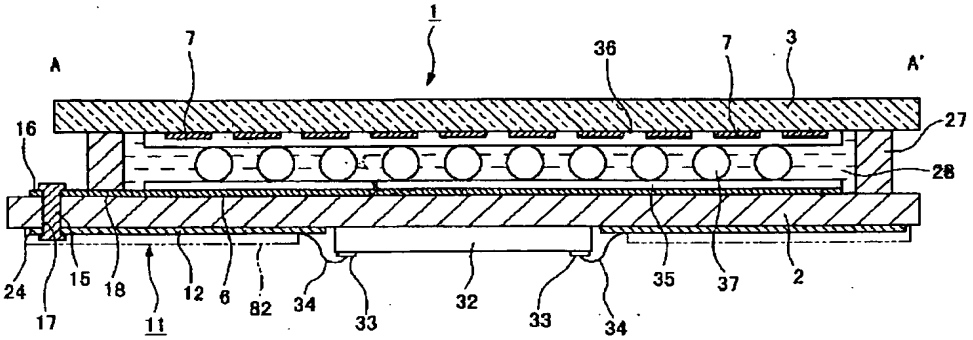

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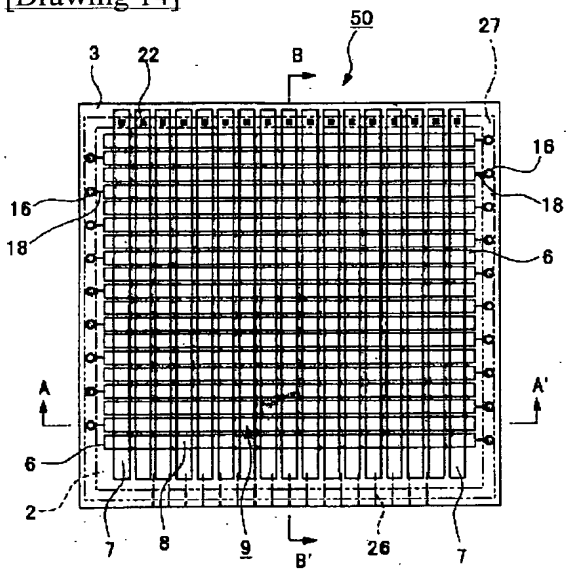

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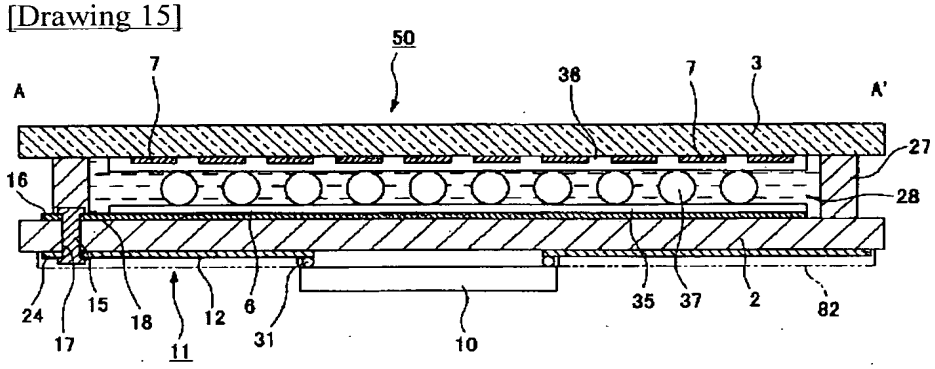

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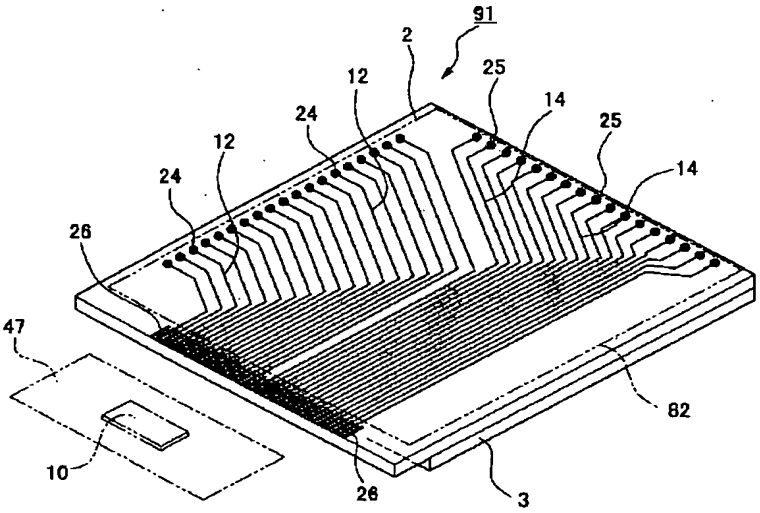

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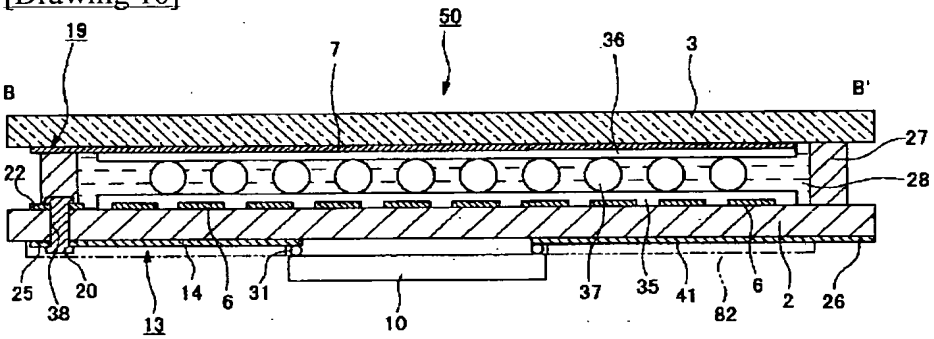

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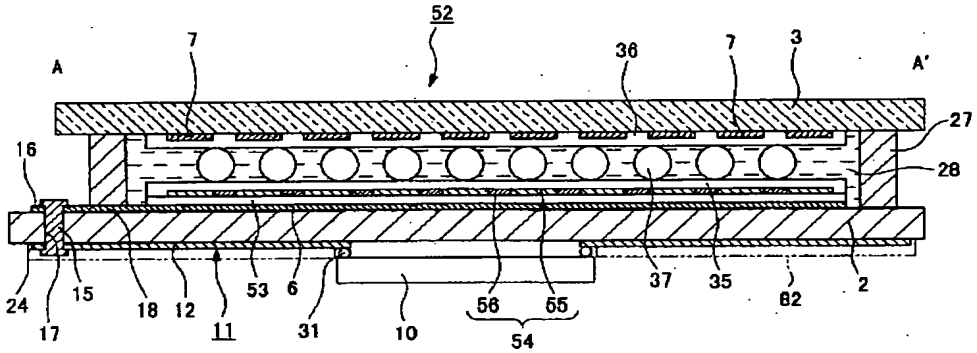

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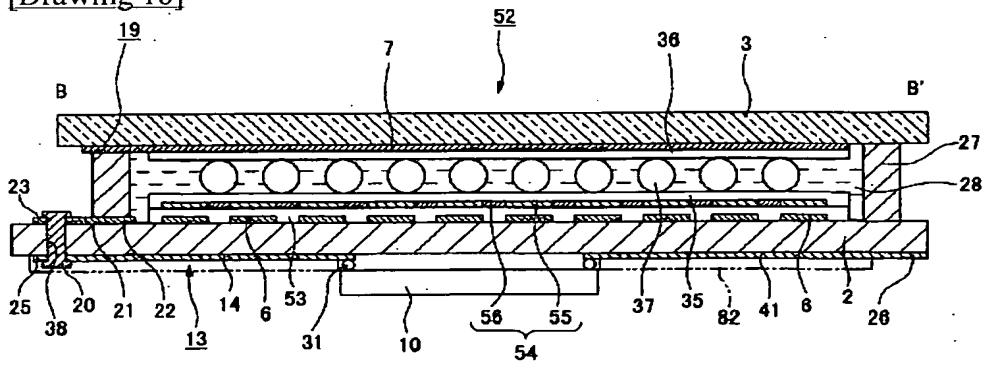
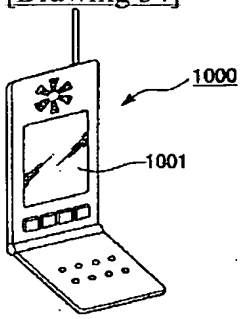


[Drawing 34]



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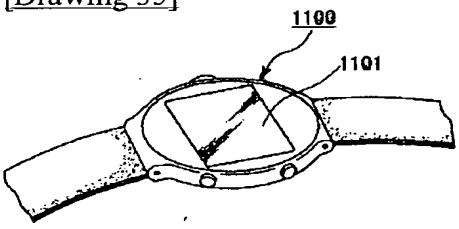

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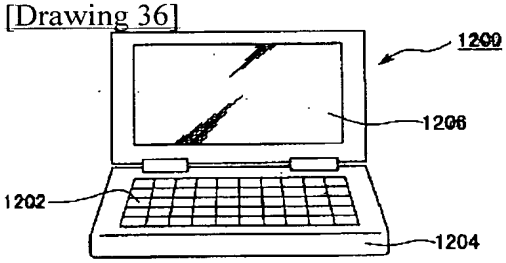

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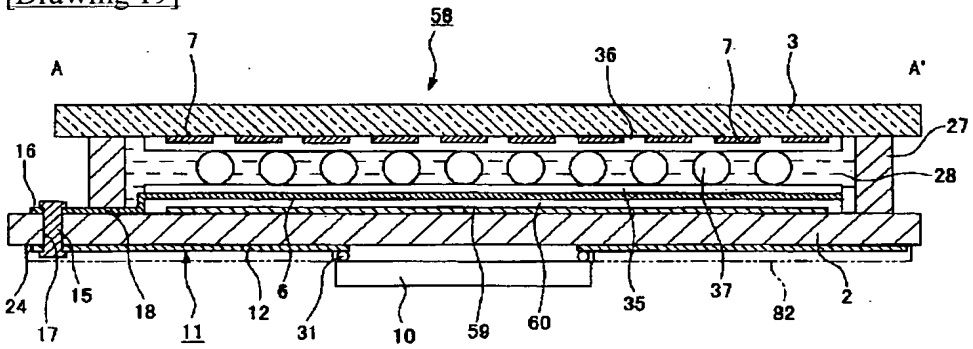

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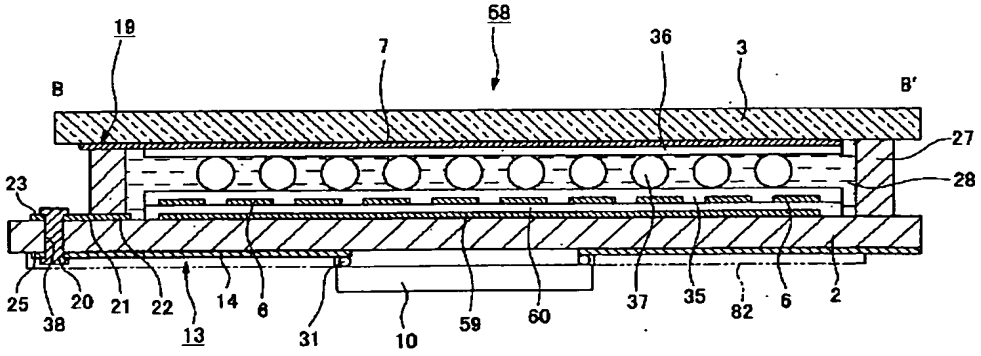

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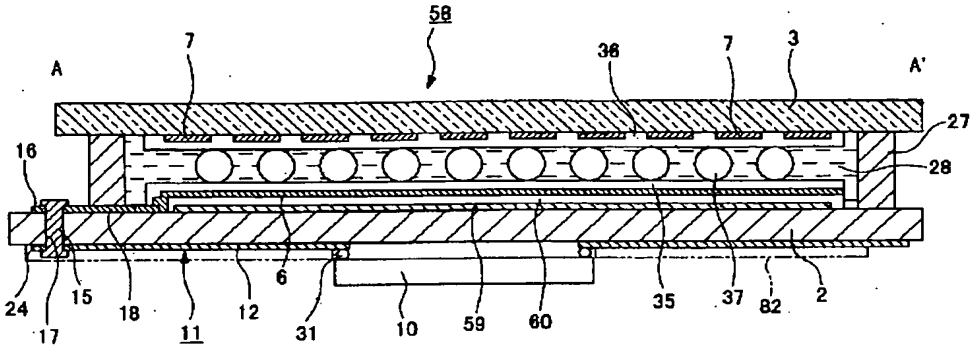
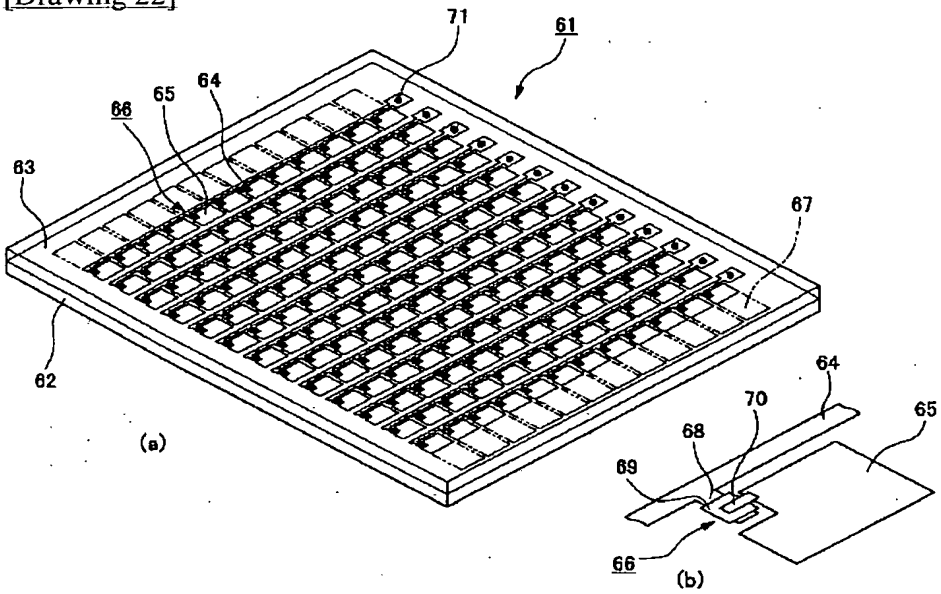
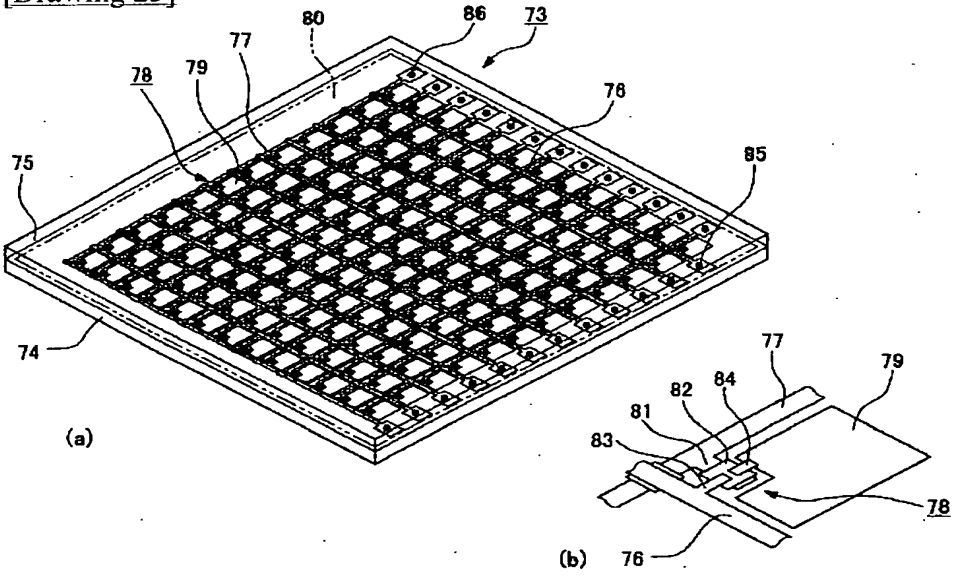


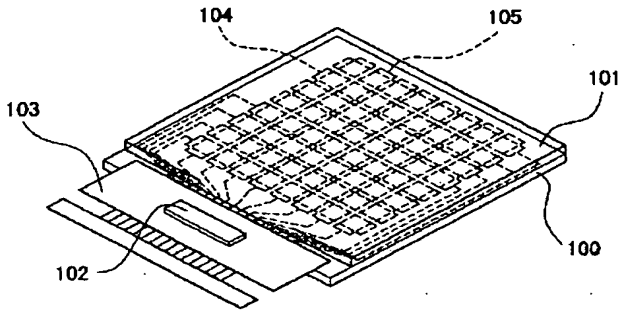
[Drawing 22]



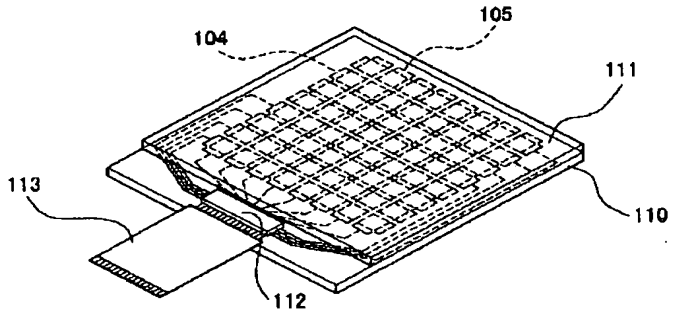
[Drawing 23]



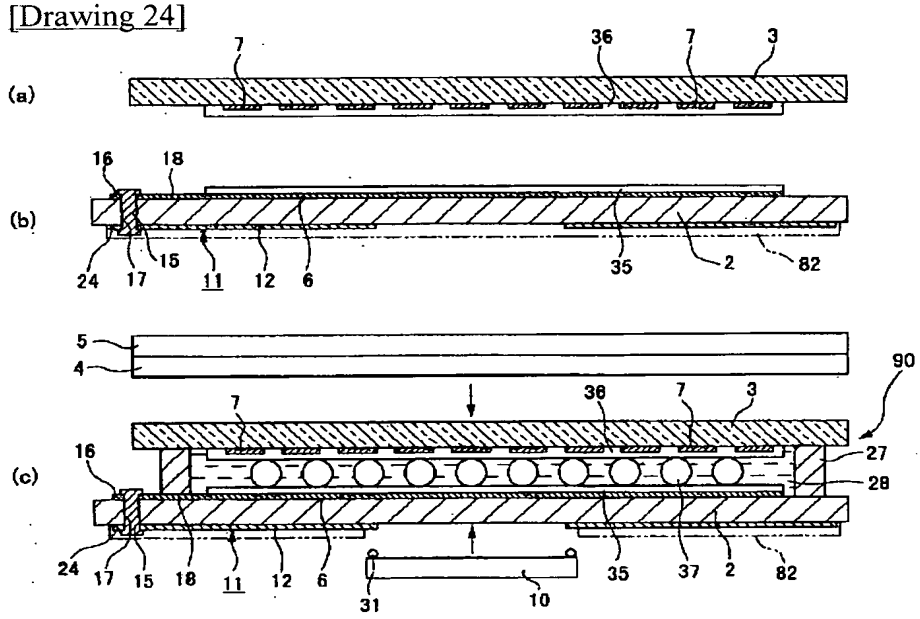
[Drawing 37]



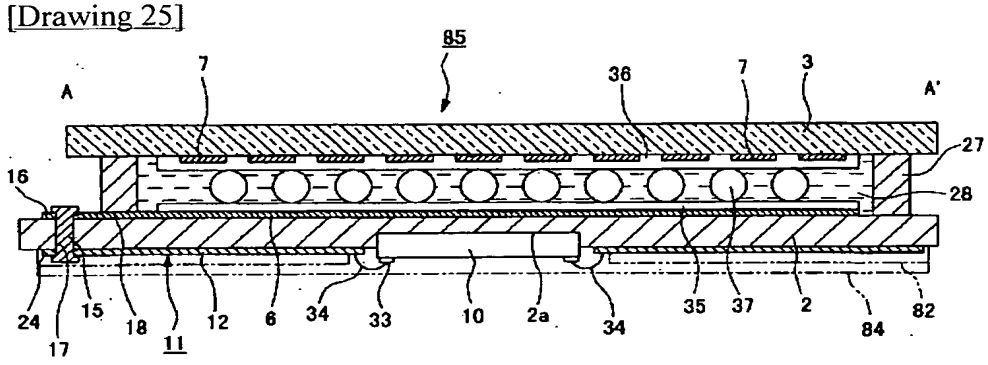
[Drawing 38]



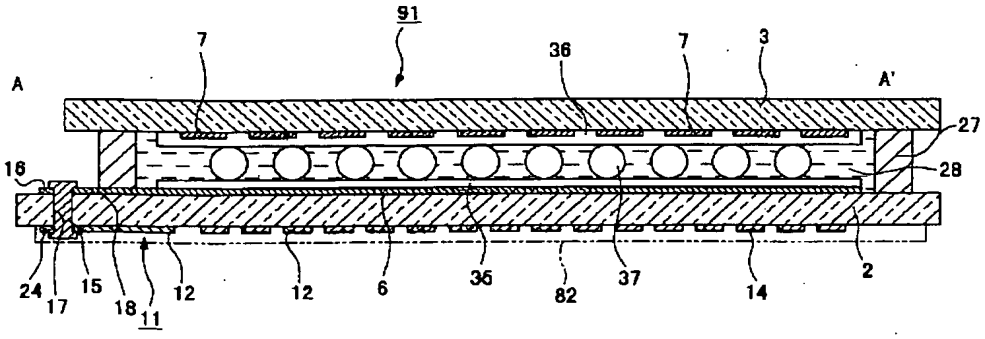
[Drawing 24]



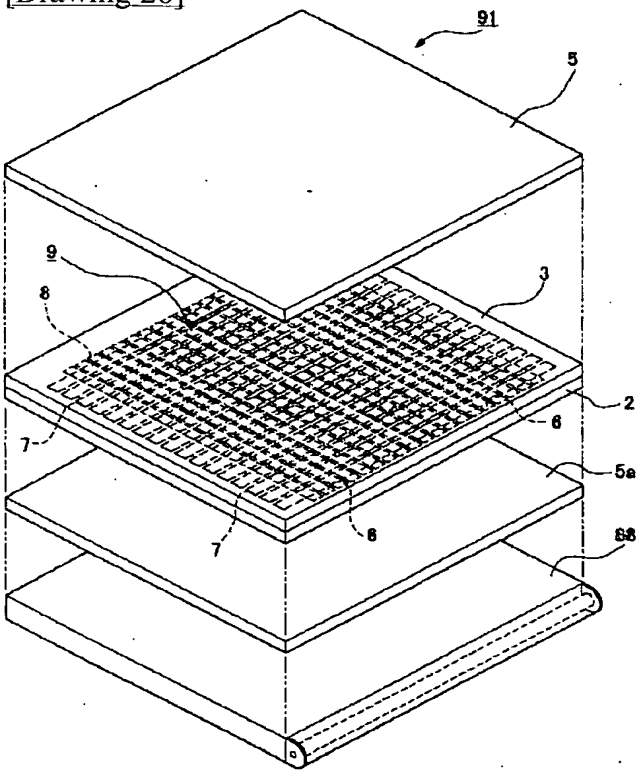
[Drawing 25]



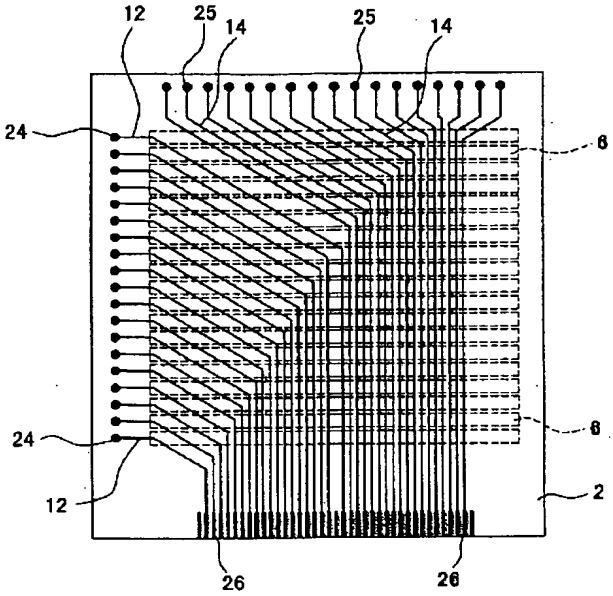
[Drawing 30]



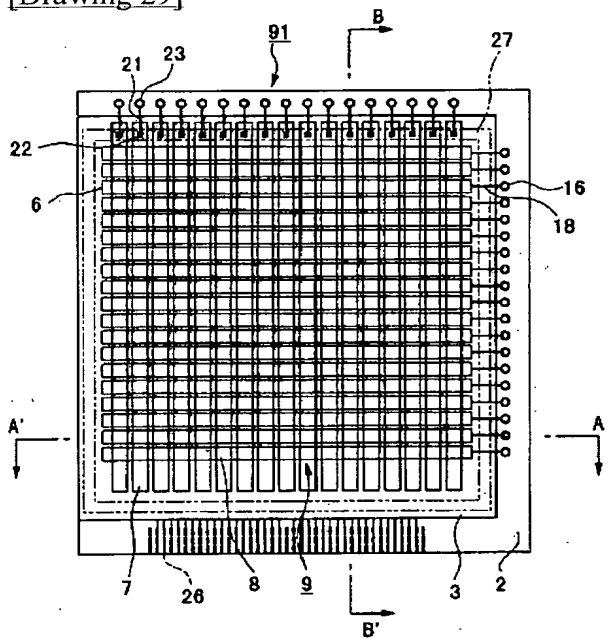
[Drawing 26]



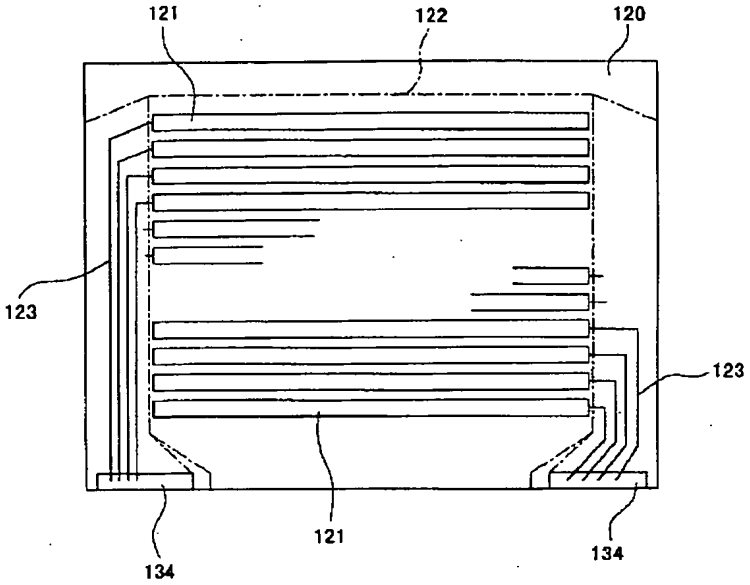
[Drawing 28]



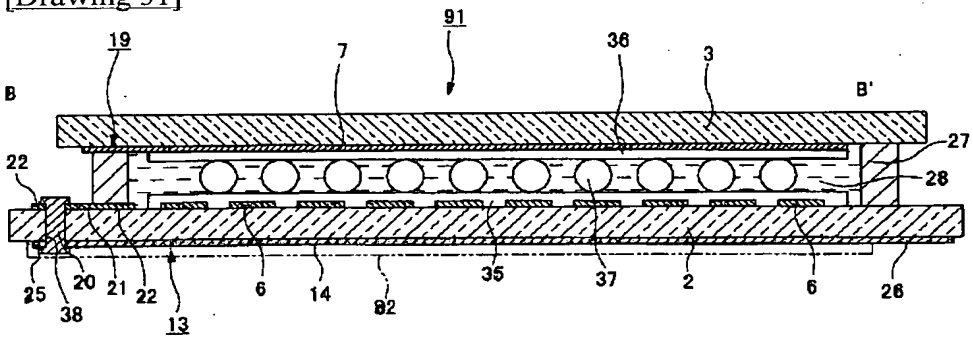
[Drawing 29]



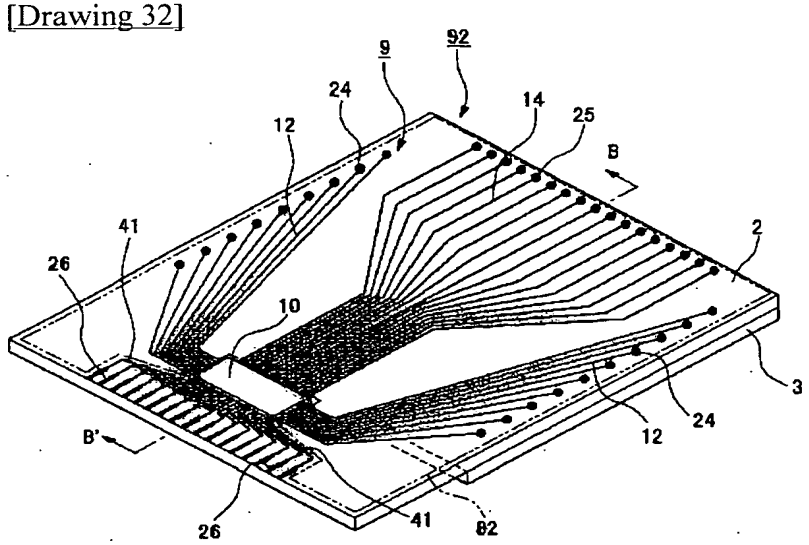
[Drawing 39]



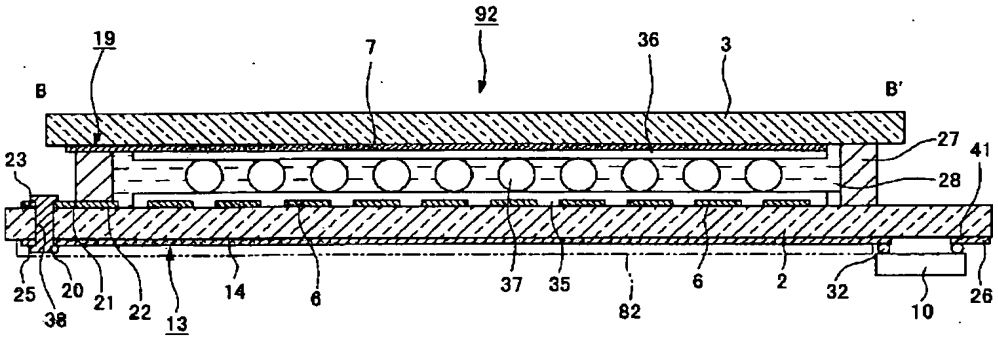
[Drawing 31]



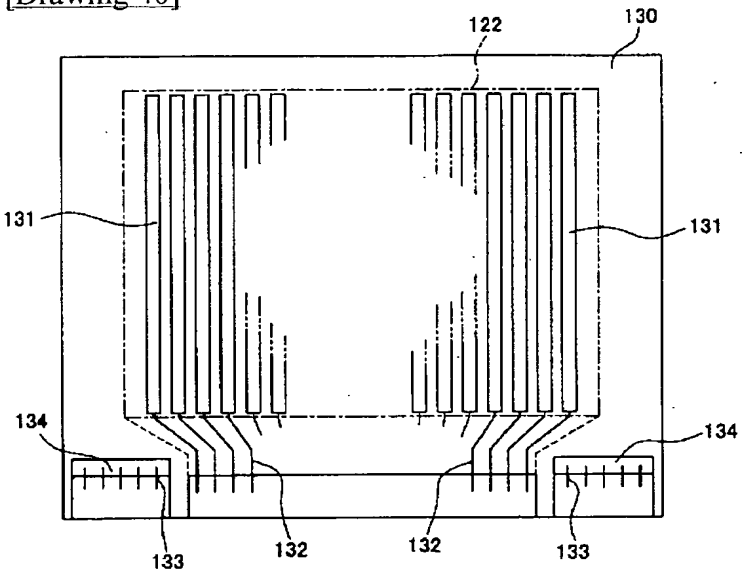
[Drawing 32]



[Drawing 33]



[Drawing 40]



[Translation done.]